IN DEFENSE OF THE DENSE

RECIPES BY ASA MEASE

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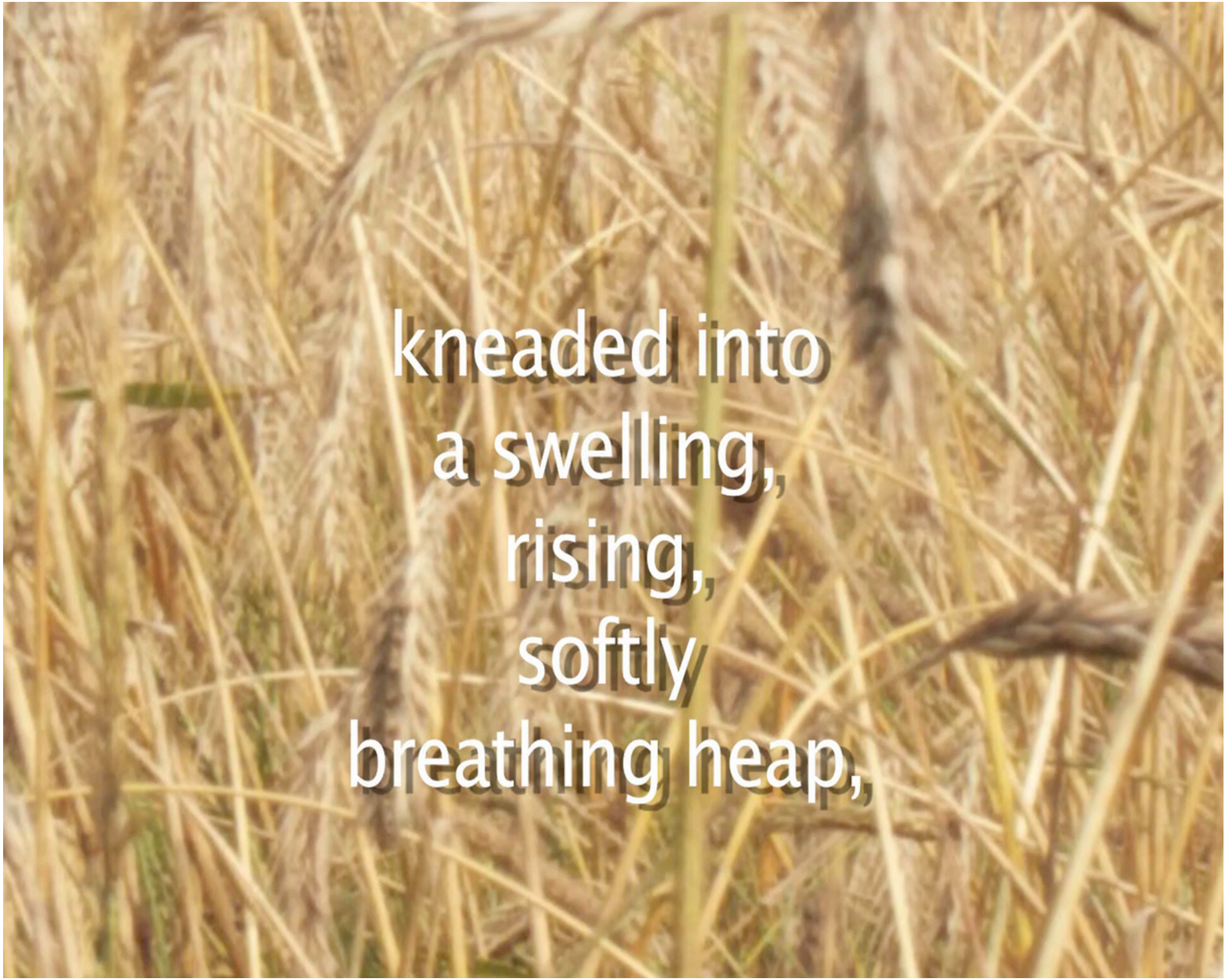
WHEAT, NITROGEN, AND IMAGININGS OF GOOD BREAD

RECIPES AND ESSAY
BY
ASA MEASE

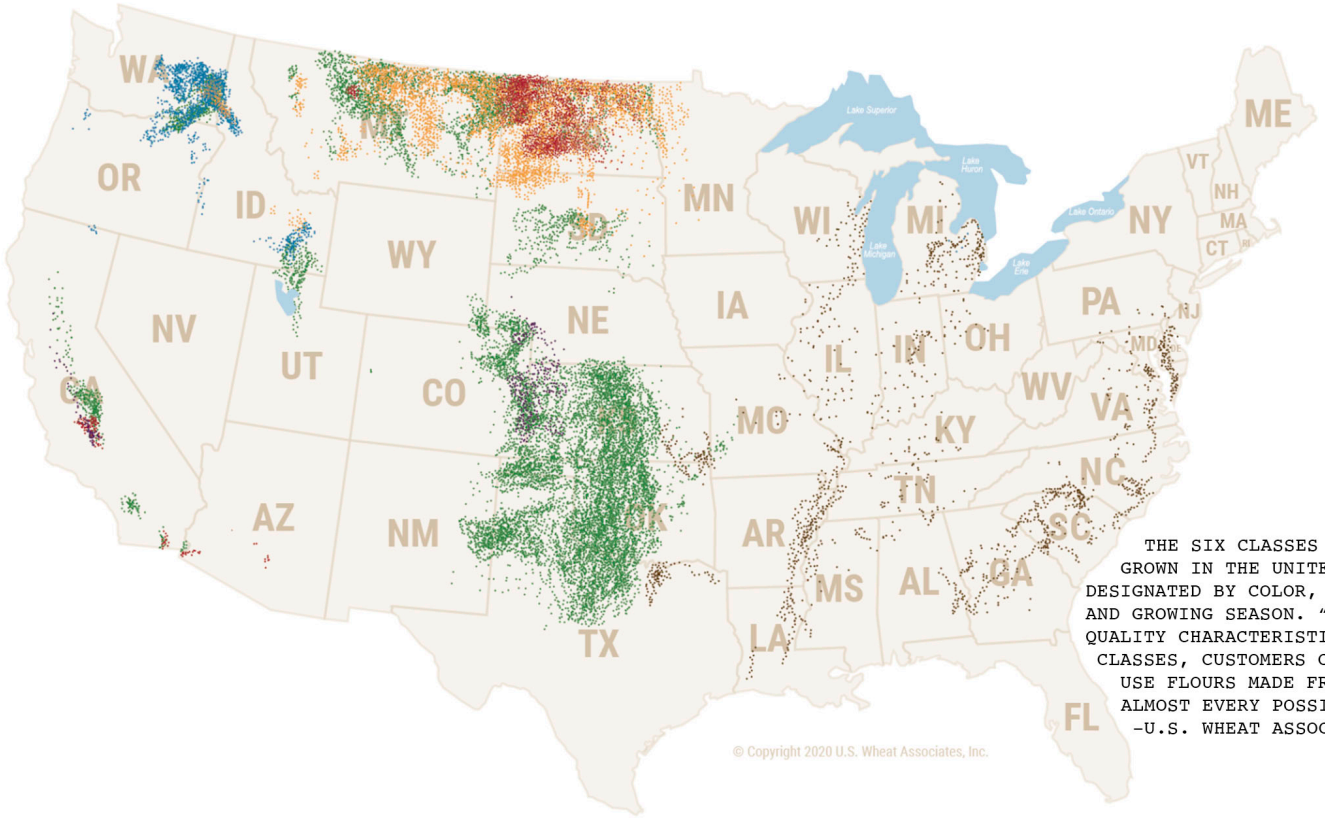
SPRING 2023


kneaded into
a swelling,
rising,
softly
breathing heap,

IT IS DIFFICULT TO TALK ABOUT BREAD BAKING WITHOUT LAPSING INTO SENTIMENTALITY… ONE IS TEMPTED TO GO ON AND ON ABOUT HOW EXHILARATED AND CONNECTED TO THE UNIVERSE ONE FEELS, ABOUT HOW THE KITCHEN ATMOSPHERE ACQUIRES SUBLIME SOULFULNESS, ABOUT HOW BORN-AGAIN BREAD MAKERS ARE MAGICAL, CHARISMATIC INDIVIDUALS…[BUT] IT IS NOT MY PLACE TO PROMISE YOU A TRANSFORMED EXISTENCE.

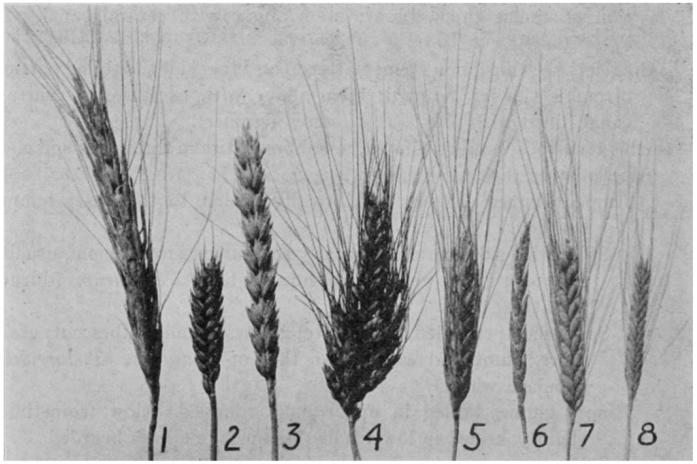
WHAT I OFFER IS ONE WITH MORE BREAD RECIPES. THE REST IS WHAT YOU MAKE OF IT.

-MOLLIE KATZEN, AUTHOR OF THE MOOSEWOOD COOKBOOK



THE SIX CLASSES OF WHEAT GROWN IN THE UNITED STATES DESIGNATED BY COLOR, HARDNESS, AND GROWING SEASON. “WITH A RANGE OF QUALITY CHARACTERISTICS WITHIN THESE CLASSES, CUSTOMERS CAN PRODUCE AND USE FLOURS MADE FROM U.S. WHEAT FOR ALMOST EVERY POSSIBLE END PRODUCT.” -U.S. WHEAT ASSOCIATES

PROMOTIONAL VIDEO
FROM PERFECT BLEND
OTHELLO, WASHINGTON, USA



SPIKES OF VARIOUS HERITAGE WHEAT: (1) POLISH WHEAT (2) CLUB WHEAT (3) COMMON BREAD WHEAT (4) POULARD WHEAT (5) DURUM WHEAT (6) SPELT (7) EMMER (8) EINKORN.

INTRODUCTION: THE STAFF OF LIFE

THROUGHOUT THE MID-19TH TO MID-20TH CENTURY AMERICANS RECEIVED ON AVERAGE 25-30% OF THEIR CALORIES FROM BREAD, AND WHEAT HAS BEEN A STAPLE CROP OF HUMANKIND SINCE THE ADVENT OF AGRICULTURE APPROXIMATELY 10,000 YEARS AGO (BOBROW-STRAIN, 2013). WHILE ITS CALORIC SHARE OF OUR DIETS HAS DROPPED STEEPLY SINCE THE 1960S, BREAD, AND THE WHEAT IT IS COMPOSED OF, IS A PARTICULARLY GOOD LENS THROUGH WHICH TO LOOK AT HOW AGRICULTURAL, CULTURAL, ECONOMIC, AND POLITICAL SYSTEMS SHAPE HOW AND WHAT WE EAT.

WHILE THIS TEXT DELINEATES SOME OF THE EDGES AND BOUNDARIES OF OUR FOOD SYSTEM, AND MORE GENERALLY ASKS THE QUESTION "HOW DO WE FEED OURSELVES NOW, AND HOW CAN WE IMAGINE EATING DIFFERENTLY IN THE FUTURE?" I AM PRIMARILY CONCERNED WITH THE FRAUGHT RELATIONSHIP BETWEEN NITROGEN, WHEAT, AND OUR IDEAS OF "GOOD BREAD." IN STAKING A CLAIM FOR WHAT GOOD BREAD IS, WE ARE *ALWAYS* MAKING CLAIMS OF WHAT A GOOD SOCIETY LOOKS LIKE AS WELL — HOW IT IS ORGANIZED AND WHO IS CONSIDERED PART OF THAT SOCIETY (BOBROW-STRAIN, 2013). BORN FROM SIMPLE INGREDIENTS: FLOUR, WATER, SALT, BACTERIA, AND YEASTS, BREAD IS THE PERFECT MEDIUM FOR MANIPULATION, ITERATION, AND REIMAGINING (WELL-INTENTIONED OR OTHERWISE) AND AS THE HISTORIC "STAFF OF LIFE" IT REPRESENTS LARGER THEMES OF OUR FOOD SYSTEM. NO OTHER FOOD IS AS INTEGRAL TO AS MANY REGIONAL DIETS, CULTURAL CUSTOMS, AND RELIGIOUS SYMBOLISM AS BREAD (BOBROW-STRAIN, 2013).

AS STACY ALAIMO STATES IN *SUSTAINABLE THIS, SUSTAINABLE THAT: NEW MATERIALISMS, POSTHUMANISM, AND UNKNOWN FUTURES*,

> "SCIENCE IS SHOWN TO BE A POLITICALLY EMBEDDED PRACTICE THAT IS TOO IMPORTANT TO BE LEFT TO THE EXPERTS…ENVIRONMENTAL ACTIVISTS OF ALL SORTS PRACTICE DIY (DO-IT-YOURSELF) SCIENCE AND CHALLENGE TRADITIONAL MODELS OF SCIENTIFIC DISTANCING, OBJECTIVITY, AND AUTHORITY…THESE MODES OF KNOWLEDGE ARE EMBEDDED, PASSIONATE, AND PURPOSEFUL—THE MIRROR IMAGE OF SCIENTIFIC OBJECTIVITY."
> (ALAIMO, 2012)

THAT IS TO SAY, THAT WHILE I AM BEHOLDEN TO THE CONVENTIONS OF SCIENTIFIC WRITING, I AM IN NO WAY AN IMPARTIAL AUTHOR. I CARE FAR TOO MUCH ABOUT WHEAT, BREAD, SOURDOUGH STARTERS, THE POLITICS OF FOOD, AND ALL THE HUMAN AND NON-HUMAN ENTITIES SWIRLING AROUND THIS TOPIC TO PRESENT A CLEAN AND COLD APPRAISAL, OR EVEN TO RENDER AN IMPACTFUL SOLUTION. RATHER, I HOPE TO DISSEMINATE WHAT I HAVE LEARNED IN MY RESEARCH, IN BAKING OVER THE PAST DECADE AS A HOBBYIST TURNED PROFESSIONAL TURNED HOBBYIST BAKER, AND ESPECIALLY TO ARTICULATE THE ZEITGEIST SURROUNDING HOME BREAD BAKING IN THE 21ST CENTURY FROM THE PERSPECTIVE OF A DIY-ER. THE SOLUTIONS THAT I OUTLINE COME IN THE FORM OF RECIPES — RECIPES AS CONCEPTUAL FRAMEWORKS FOR CROP ROTATIONS, RECIPES FOR BREADS OF THE PAST, AND RECIPES OF IMAGINED FUTURES. EACH RECIPE, FROM ANNIE'S MAC AND CHEESE AND CRISP ARTISAN SOURDOUGH TO GARLIC-LADEN AIOLI AND DENSE BREAD OF MY OWN CRAFTING, DEMARCATE SIGNIFICANT TOUCHSTONES IN MY OWN THOUGHTS ON EATING, GENEROSITY, AND WHAT "GOOD BREAD" MIGHT BE.

AS THE CENTER FOR GENOMIC GASTRONOMY, AN ARTIST-LED ORGANIZATION NOTES, "WITHIN OUR GLOBAL CIVILIZATION AND GLOBAL FOOD SYSTEM, EATERS ARE AGENTS OF SELECTION. THE GENES, GENOMES, AND INGREDIENTS THAT ARE PROPAGATED ARE THE ONES YOU PREFER TO EAT… EVERY HUMAN EATER SLOWLY REFORMULATES THE PLANET AS THEY CONSUME IT" (FLOOD ET AL., 2019). THEREFORE I HAVE ARRANGED THIS TEXT TO FOCUS ON HOW INDIVIDUALS RELATE AND SHAPE THE FOOD LANDSCAPE THROUGH MEALS, RECIPES, AESTHETICS OF FOOD, AND POLITICAL THOUGHT.

I AM OPPOSED TO FOISTING THE BLAME ON THE INDIVIDUAL AS BRITISH PETROLEUM'S 2004 WIDELY SUCCESSFUL AD CAMPAIGN AND POPULARIZATION OF THE PERSONAL "CARBON FOOTPRINT" DID FOR CLIMATE CHANGE DISCOURSE (KAUFMAN, 2020). MODERN METHODS OF AGRICULTURE THAT EMPLOY FOSSIL FUELS, PESTICIDES, LARGE MACHINERY, AND MONOCULTURES — INDUSTRIALIZING AN ACTIVITY THAT UNTIL RECENTLY, MOST HUMANS SPENT MOST OF THEIR TIME DOING — IS THE RESULT OF DECISIONS MADE BY MULTINATIONAL CORPORATIONS, GOVERNMENT POLICIES AND INCENTIVES, AND NEOLIBERAL GLOBALIZATION (FLOOD ET AL., 2019). HENRI LEFEBVRE'S 1953 WORK *PERSPECTIVES ON RURAL SOCIOLOGY* NOTES, "NATIONAL AND GLOBAL MARKETS LED TO *SPECIALIZATION*…SOCIAL AND POLITICAL ORGANIZATION, GOVERNMENT POLICY, PLANS — OR LACK OF PLANS, OR THEIR FAILURE — HAVE ACTED AND REACTED ON THE REMOTEST PLACES ON THE PLANET."

THESE ARE THE "CHOICE ARCHITECTURES" THAT COERCE AND CONSTRAIN THE POSSIBILITIES EACH OF US HAVE AT THE GROCERY, FARMERS MARKET, RESTAURANT, AND CONVENIENCE STORE. THESE TOOLS ARE PARTICULARLY EFFECTIVE AT OBSCURING HIDDEN COSTS WITHIN OUR DAILY CHOICE OF WHAT AND HOW TO EAT, AND HOW THOSE DECISIONS REVERBERATE IN OUR LOCAL AND GLOBAL COMMUNITIES (FLOOD ET AL., 2019). LEFEBVRE URGES US NOT TO, "NEGLECT THE OTHER ASPECT OF REALITY, WHICH CONTRADICTS THE PREVIOUS ONE: AGRICULTURE BRINGS WITH IT RESIDUES, SURVIVALS FROM THE DISTANT PAST" (LEFEBVRE, 1953).

COMMODITY WHEAT

WHEAT RANKS THIRD IN FIELD CROPS PRODUCED IN THE U.S. (BEHIND CORN AND SOYBEANS) AND FARMERS PRODUCED 1.65 BILLION BUSHELS ON 35.5 MILLION ACRES IN THE 2022-23 SEASON (UNITED STATES DEPARTMENT OF AGRICULTURE, 2022). WHEAT IS GROWN COMMERCIALLY IN NEARLY EVERY STATE, BUT TWO THIRDS IS PRODUCED IN THE GREAT PLAINS STRETCHING FROM TEXAS TO MONTANA (ALI ET AL., 1995). WHEAT IS GROWN IN MARGINAL SOILS AND WHERE WATER IS SCARCE, OFTEN AT GREAT DISTANCES FROM POPULATION CENTERS, AND IN LARGE MONOCULTURES WITH SPECIALIZED EQUIPMENT — FACTS THAT COMPLICATE OUR ABILITY TO INTEGRATE IT WITHIN AN LOCAL, SMALL-SCALE, PASTORAL AGRICULTURAL VISION LIKE WE CAN WITH VEGETABLES AND FRUIT. AS STEPHEN JONES, DIRECTOR OF WASHINGTON STATE UNIVERSITY BREAD LAB NOTES,

FROM THE WHY CHEAP ART? MANIFESTO LETTERPRESS BY BREAD & PUPPET.

ART IS LIKE GOOD BREAD!

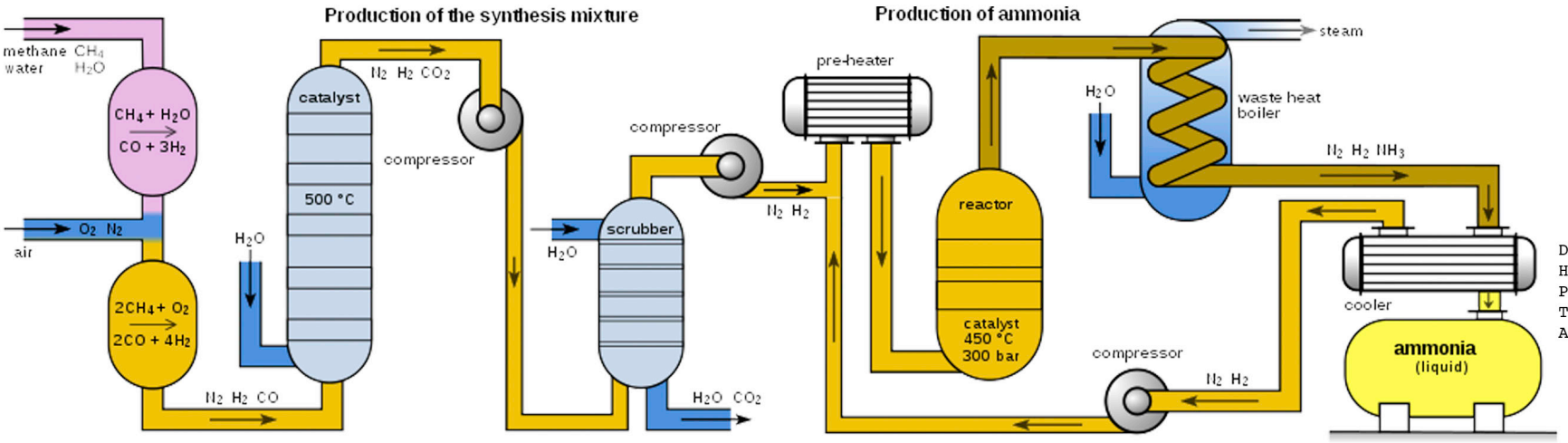


DIAGRAM OF THE HABER-BOSCH PROCESS USED TO MANUFACTURE AMMONIA.

DIFFERENT RATIOS OF FARM MANURE AND SYNTHETIC AMMONIA USED ON FARMLAND AND ITS EFFECT ON THE GRAIN QUALITY OF WHEAT. 75% UREA + 25% MANURE WAS FOUND TO BE OPTIMAL. (REHIM ET AL., 2020)

Treatments	Protein contents (%)		Starch contents (%)		Gluten contents (%)	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
0% urea + 0% FM	9.22^{e}	9.24^{e}	52.26^{e}	52.27^{f}	6.86^{e}	6.97^{e}
100% urea + 0% FM	10.15^{c}	10.16^{c}	53.65^{d}	53.66^{d}	8.49^{c}	8.51^{c}
75% urea + 25% FM	11.96^{a}	11.97^{a}	55.40^{a}	55.41^{a}	10.08^{a}	10.10^{a}
50% urea + 50% FM	10.98^{b}	11.00^{b}	54.67^{b}	54.70^{b}	9.08^{b}	9.10^{b}
25% urea + 75% FM	10.20^{c}	10.22^{c}	53.99^{c}	54.00^{c}	8.91^{b}	8.93^{b}
0% urea + 100% FM	9.85^{d}	9.86^{d}	52.72^{d}	52.73^{e}	7.74^{d}	7.75^{d}

FM, farm manure. $^{a\text{-}f}$Different letters in the same column indicate significant differences by least significant difference test at $P \leq 0.05$.

> OUT OF PLACE" IS A DEFINITION OFTEN LEFT TO THOSE "IN PLACE." THE RIGHT PLACE THEN MORPHS INTO THE RIGHTFUL PLACE. KANSAS IS "THE WHEAT STATE." THE WHEAT BELT OF THIS COUNTRY, WITH ALL OF ITS AMBER IMAGES, NEEDS NO ADDITIONAL DESCRIPTION HERE. WE ALL KNOW THAT THE CENTER OF THE COUNTRY IS WHERE WHEAT IS GROWN, AND THAT WHEAT IS GROWN THERE BECAUSE IT IS THE BEST PLACE IN THE WORLD TO GROW IT. RIGHT? WHERE DOES ONE GROW WHEAT? THERE. WHY? BECAUSE THAT IS WHERE IT IS GROWN...TODAY COMMODITY WHEAT IS A DEFAULT CROP. IT IS GROWN IN THE CENTER OF THE COUNTRY NOT BECAUSE THAT IS THE BEST PLACE TO GROW WHEAT. RATHER IT IS GROWN THERE BECAUSE YOU CANNOT GROW OTHER HIGHER-VALUE CROPS.
> (JONES, 2012)

WHEAT IS GROWN ALMOST EVERYWHERE, BUT IT ISN'T OFTEN THE FOCUS OF THOSE REGIONS. FOR FARMERS GROWING MORE VALUABLE CROPS, WHEAT IS A USEFUL TOOL IN CROP ROTATIONS TO BREAK PEST CYCLES, AND AS ONE FARMER NOTED "WHEN I GROW WHEAT I JUST WANT TO LOSE LESS MONEY" (JONES, 2012). IN EASTERN WASHINGTON THE MAJORITY OF WHEAT IS A SOFT WHITE THAT IS EXPORTED OVERSEAS FOR PRODUCTION INTO NOODLES, SNACKS, AND DESSERTS. NORTH DAKOTA IS WHERE MOST OF THE NORTHERN DURUM USED FOR PASTA IS GROWN (BOBROW-STRAIN, 2013)(JONES, 2012). NEITHER OF THESE WHEATS ARE PARTICULARLY SUITABLE FOR ARTISAN BREAD AS WE KNOW IT, BUT THEY ARE THE WHEAT IDENTITY OF THAT REGION. THE SOIL, CLIMATE, AND AVAILABILITY OF LAND TO GROW WHEAT IS DIRECTLY LINKED TO HOW A LOCAL AGRICULTURAL SYSTEM PROVIDES CALORIES AND PROTEIN TO ITS POPULATION (DÖRING AND NEUHOFF, 2021).

WHEAT IS ONE OF THE LEAST CHEMICALLY INTENSIVE CROPS TO GROW, AND YET THE QUALITY OF THE FLOUR MILLED IS INTRINSICALLY LINKED TO NITROGEN AVAILABILITY IN THE SOIL (CARCEA ET AL., 2006)(REHIM ET AL., 2020)(TAUTGES ET AL., 2022). THE PERCENT OF PROTEIN IN WHEAT, IN THE FORM OF GLUTEN PROTEINS (GLIADIN AND GLUTENIN), INDICATES THE QUALITY AND USE OF THE WHEAT GROWN — THE HIGHER THE PERCENT OF PROTEIN, THE MORE SUITABLE IT IS TO PRODUCE VISCOELASTIC, OPEN-CRUMB LOAVES OF BREAD (CARCEA ET AL., 2006)(REHIM ET AL., 2020). FOR THE CLASS OF WHEAT GROWN FOR "BREAD FLOUR" — A HIGH PROTEIN, WHITE FLOUR WITH THE BRAN AND GERM REMOVED, AND OFTEN BLEACHED AND ENRICHED — AVAILABLE MINERALIZED NITROGEN IS OF SIGNIFICANT CONCERN (REHIM ET AL., 2020).

ROLLER MILLS, POPULARIZED IN THE UNITED STATES IN THE EARLY 20TH CENTURY, ALLOWED FOR CHEAP AND EFFICIENT PRODUCTION OF WHITE FLOURS (ECONOPOULY AND JONES, 2020). IN THE 1930'S, THE USDA RELEASED A STATEMENT IN SUPPORT OF WHITE FLOUR, NOTING THAT IT KEPT BETTER THAN WHOLE WHEAT, WAS CHEAPER TO MILL, AND MORE EFFICIENT TO BAKE (BOBROW-STRAIN, 2013). ADDITIONALLY, BECAUSE THIS FLOUR USES LESS OF EACH KERNEL IT "HELPED FARMERS BY INCREASING DEMAND" (BOBROW-STRAIN, 2013). IN 2017, ONLY 5.4% OF FLOUR PRODUCED IN THE U.S. WAS WHOLE WHEAT, AND THE REST WAS WHITE FLOUR OF VARIOUS GRADES (SOSLAND, 2018).

AS OF 2016, THERE ARE ONLY 26 MAJOR FLOUR MILLS IN THE NATION — DOWN FROM 23,661 LOCAL MILLS IN 1840, AND OF THOSE 26, THREE HANDLE 61% OF THE DOMESTIC FLOUR PRODUCTION (ECONOPOULY AND JONES, 2020). WHITE BREAD FLOUR IS THE PREDOMINANT INGREDIENT IN BREADS LIKE CIABATTA, BAGUETTES, AND THE ARTISAN BREADS POPULARIZED BY AMERICAN BAKERIES SINCE THE 90'S (BOBROW-STRAIN, 2013). FOR THE HOME BAKER, BREAD FLOUR IS THE FOCUS OF MANY CONTEMPORARY RECIPES — FROM NO KNEAD BREAD, TO PIZZA DOUGH AND FOCACCIA, TO THE SOURDOUGH LOAVES DISSEMINATED THROUGH BREAD BOOKS, BLOGS, AND INSTAGRAM.

HABER-BOSCH: RECIPE FOR SYNTHESIS

FOR THE PAST 100 YEARS IN NORTH AMERICA, THE MINERALIZED NITROGEN NEEDED TO FEED THE COUNTRY AND WORLD'S POPULATION HAS PRIMARILY COME FROM CONVERTING ATMOSPHERIC NITROGEN (N_2) TO AMMONIA (NH_3) USING THE HABER-BOSCH PROCESS UNDER INTENSE HEAT AND PRESSURE SUPPLIED BY FOSSIL FUELS — NATURAL GAS CREATING SYNTHETIC FERTILIZER (SMART, 2022). THE HABER-BOSCH PROCESS SUPPLIES THE NITROGEN NEEDS FOR OVER HALF OF GLOBAL FOOD PRODUCTION AND DEMAND FOR NITROGEN FERTILIZERS IS EXPECTED TO INCREASE AS THE WORLD'S POPULATION GROWS (SMART, 2022). GLOBAL APPLICATION OF AGRICULTURAL NITROGEN WAS 249 TERAGRAMS (1 TG = 1 BILLION KG) IN 2013, WITH 107 TG COMING FROM SYNTHETIC NITROGEN, AND 30 TG COMING FROM NITROGEN-FIXING LEGUMES. THROUGH ALL THE CROPS HARVESTED, ONLY 93 TG OF EQUIVALENT NITROGEN WAS REMOVED, INDICATING THAT THERE WAS A SIGNIFICANT (~60%) ENRICHMENT OF THE PLANET WITH EXCESS NITROGEN (DÖRING AND NEUHOFF, 2021).

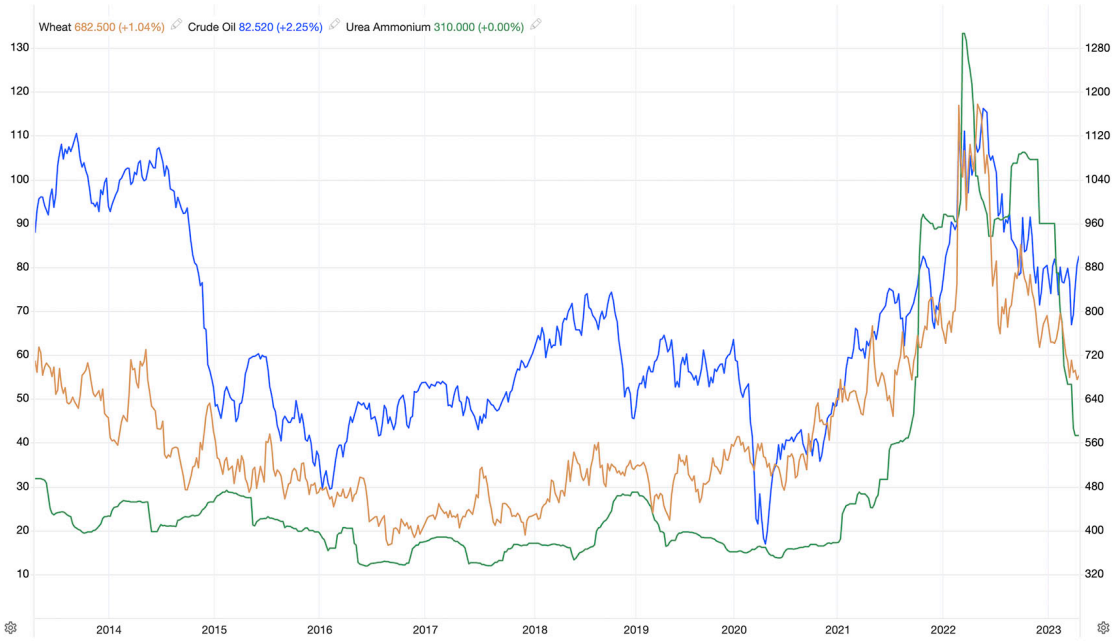
THE HABER-BOSCH PROCESS CONVERTS NITROGEN AND HYDROGEN GASES INTO AMMONIA THROUGH THE FOLLOWING SYNTHESIS IN THE PRESENCE OF A METALLIC CATALYST:

$$N_2 + 3\ H_2 \leftrightarrow 2\ NH_3 \quad \Delta H_{427^{\circ}C} = -52\ KJ\ MOL^{-1}$$

DOZENS OF COMPANIES PRODUCE NITROGEN BASED FERTILIZERS THROUGHOUT THE COUNTRY, AND ARE DIRECTLY SUPPLIED WITH FOSSIL FUELS BY PIPELINE FOR THE ENERGY INTENSIVE PROCESS. THE RESULTING SOLID AND LIQUID FERTILIZERS ARE SHIPPED TO AGRICULTURAL REGIONS BY PIPE, RAILCAR, TRUCK, AND SHIP (CENTER FOR LAND USE INTERPRETATION, 2019). THE CURRENT PRODUCTION OF AGRICULTURAL AMMONIA IS ESTIMATED TO EQUATE TO ONE PERCENT OF GLOBAL CO_2 EMISSIONS, AND THE OVERAPPLICATION AND INEFFICIENT UPTAKE IN AGRICULTURAL SYSTEMS HAS CAUSE EUTROPHICATION AND DESTRUCTION OF ECOSYSTEMS (SMART, 2022). THE TRADE-OFF IS THAT SYNTHETIC FERTILIZERS HAVE MADE IT POSSIBLE TO SUPPORT 8 BILLION HUMANS ON THE PLANET (AT LEAST FOR NOW), BROUGHT MILLIONS OUT OF SUBSISTENCE FARMING, AND TRANSFORMED THE ECONOMIC SYSTEMS OF NATIONS — FREEING THE MAJORITY FROM FARMING THEIR OWN FOOD (43% OF THE U.S. WORKED AS FARMERS IN 1890 COMPARED TO 1.3% IN 2022) (DÖRING AND NEUHOFF, 2021)(UNITED STATES DEPARTMENT OF AGRICULTURE, 2023).

DYNO NOBEL INC. CHEMICAL PLANT
(YES THAT NOBEL)
DEER ISLAND, OREGON, USA
ALONG THE COLUMBIA RIVER.
PRODUCES AGRICULTURAL CHEMICALS
INCLUDING AMMONIUM NITRATE.

WHEATFIELD — A CONFRONTATION, AGNES DENES, 1982
TWO ACRES OF WHEAT GROWN ON A LANDFILL
AND HARVESTED IN AUGUST OF THAT YEAR.
BATTERY PARK, NEW YORK, USA
THE LAND BENEATH THE WHEAT WAS VALUED AT
$4.5 BILLION AND HAS SINCE BEEN DEVELOPED.



COMMODITY PRICES OF WHEAT, CRUDE OIL,
AND UREA AMMONIUM OVER THE PAST DECADE.

RECENT SPIKES COINCIDE WITH THE
RUSSIAN INVASION OF UKRAINE. UKRAINE
(EUROPE'S BREADBASKET) IS THE FIFTH
LARGEST EXPORTER OF WHEAT. RUSSIA
IS THE LARGEST EXPORTER OF WHEAT AND
THE SECOND LARGEST PRODUCER OF OIL.

WHILE THERE IS A CONSENSUS THAT THE CURRENT FOOD PRODUCTION IS SUFFICIENT TO MEET OUR CALORIC NEEDS, ACCESS TO THESE RESOURCES IS UNEQUALLY DISTRIBUTED DUE TO POLITICAL AND ECONOMIC CONDITIONS (DÖRING AND NEUHOFF, 2021). MANY OF THE MULTINATIONAL CORPORATIONS PRODUCING THE WORLD'S SYNTHETIC FERTILIZER SUPPLIES ARE ADDITIONALLY PRODUCING THE NITRATES REQUIRED FOR MUNITIONS AND EXPLOSIVES USED IN WAR AND MINERAL EXTRACTION (CENTER FOR LAND USE INTERPRETATION, 2019). IN THE U.S., 99.4% OF ALL WHEAT IS PRODUCED CONVENTIONALLY USING SYNTHETIC FERTILIZERS AND PESTICIDES AND IS SOLD ON THE COMMODITY MARKET (TAUTGES ET AL., 2022).

TRANSITIONING TO ORGANIC

A META-ANALYSIS OF THE UPPER LIMITS TO SUSTAINABLE ORGANIC WHEAT YIELDS FOUND THAT IF:

(1) THE MAJORITY OF MINERAL N FERTILIZER IS APPLIED TO ARABLE LAND

(2) THE CURRENT PRODUCTION LEVEL OF STAPLE CROPS NEEDS TO BE AT LEAST MAINTAINED

(3) THE N USE EFFICIENCY (43%) REMAINS UNALTERED

(4) THE AVERAGE GLOBAL BIOLOGICAL NITROGEN FIXATION AMOUNTS TO 165 KG N/HA, THE REPLACEMENT OF ~ 83 TG OF N WOULD AT LEAST REQUIRE SOME ~ $500*10^6$ HA OF FODDER LEGUMES, WHICH CORRESPONDS TO APPROXIMATELY $1/3^{RD}$ OF THE CURRENT TOTAL GLOBAL ARABLE LAND AREA.
(DÖRING AND NEUHOFF, 2021)

TO TRANSITION ENTIRELY AWAY FROM SYNTHETIC FERTILIZER USE IN WHEAT PRODUCTION APPEARS TO BE AN INSURMOUNTABLE TASK WITH OUR CURRENT TECHNOLOGY, WHEN CONSIDERING THE LAND REQUIREMENTS FOR LEGUMES NEEDED TO BRING THE SOIL NITROGEN TO THE LEVELS ADEQUATE FOR BREAD-QUALITY WHEAT PRODUCTION (DÖRING AND NEUHOFF, 2021)(REHIM ET AL. 2020). YIELDS IN ORGANIC CEREAL SYSTEMS ARE NOTED TO BE ON AVERAGE 14-17% (AND UP TO 84%) LOWER THAN CONVENTIONAL FARMING (DÖRING AND NEUHOFF, 2021)(REHIM ET AL. 2020). THIS SHORTFALL IS PREDOMINATELY ASCRIBED TO THE AVAILABILITY OF NITROGEN, BUT FACTORS LIKE PERSISTENT WEEDS, LIMITS ON OTHER MACRO AND MICRO NUTRIENTS, TOPSOIL DEPLETION THROUGH TILLAGE, AND PESTS ALSO CONTRIBUTED (TAUTGES ET AL., 2022). DECADES OF HEAVY SYNTHETIC FERTILIZER USE HAS PRODUCED LONG-TERM DEGRADATION OF SOIL FERTILITY THAT MAKES IMMEDIATE TRANSITION TO ORGANIC DIFFICULT (TAUTGES ET AL., 2022).

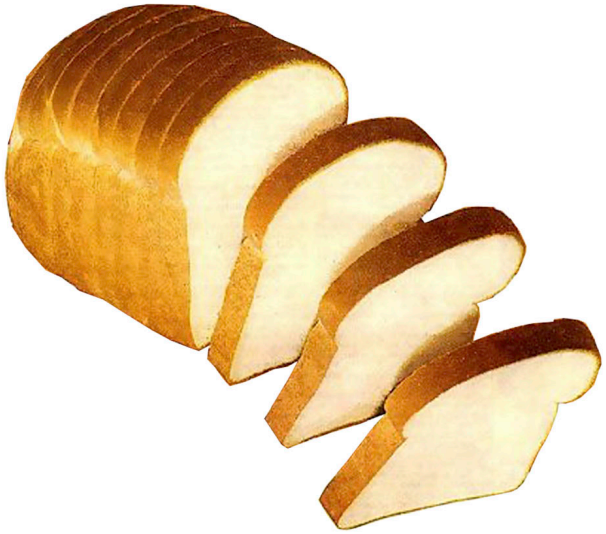
THE ADDITION OF ANIMAL MANURES CAN INCREASE NITROGEN, SOIL ORGANIC MATTER, AND WATER HOLDING CAPACITY OF THE SOIL (TAUTGES ET AL., 2022)(DÖRING AND NEUHOFF, 2021)(REHIM ET AL., 2020). HISTORIC EXCLUSION OF ANIMALS FROM WHEAT GROWING REGIONS MAKES ACCESS TO NECESSARY QUANTITIES OF MANURE PROHIBITIVELY EXPENSIVE (TAUTGES ET AL., 2022). ORGANIC GRAIN FARMERS REPORT USING ON AND OFF-FARM MANURE FROM CHICKENS, CATTLE, AND HORSES, ALONG WITH MANUFACTURED FERTILIZERS FROM CHICKEN MANURE (PERFECT BLEND 4-4-4) AND FISH EMULSIONS TO BOOST PROTEIN LEVELS IN THEIR WHEAT (KAHL ET AL., 2020)(PERFECT BLEND ORGANICS, N.D.). EVEN WITH ADEQUATE MANURE APPLICATIONS, ORGANIC FARMING PRACTICES ARE NOT FOUND TO PRODUCE WHEAT THAT MEETS THE BREAD FLOUR PROTEIN CONTENT MINIMUM OF 14% (KAHL ET AL., 2020)(TAUTGES ET AL., 2022). WHEAT GROWN USING CONVENTIONAL PROCESSES REGULARLY REACHES 13.9% TO 15.2% PROTEIN (TAUTGES ET AL., 2022). THE INTEGRATION OF NON-LEGUME CROP RESIDUE AND ANIMAL MANURES CAN MEET TEMPORARY NITROGEN NEEDS, BUT ORGANIC AND NON-ORGANIC FARMERS MUST RELY ON LONG-TERM CROP ROTATIONS THAT FOCUS ON NITROGEN-FIXING LEGUMES FOR SUSTAINED NITROGEN BALANCE (DÖRING AND NEUHOFF, 2021).

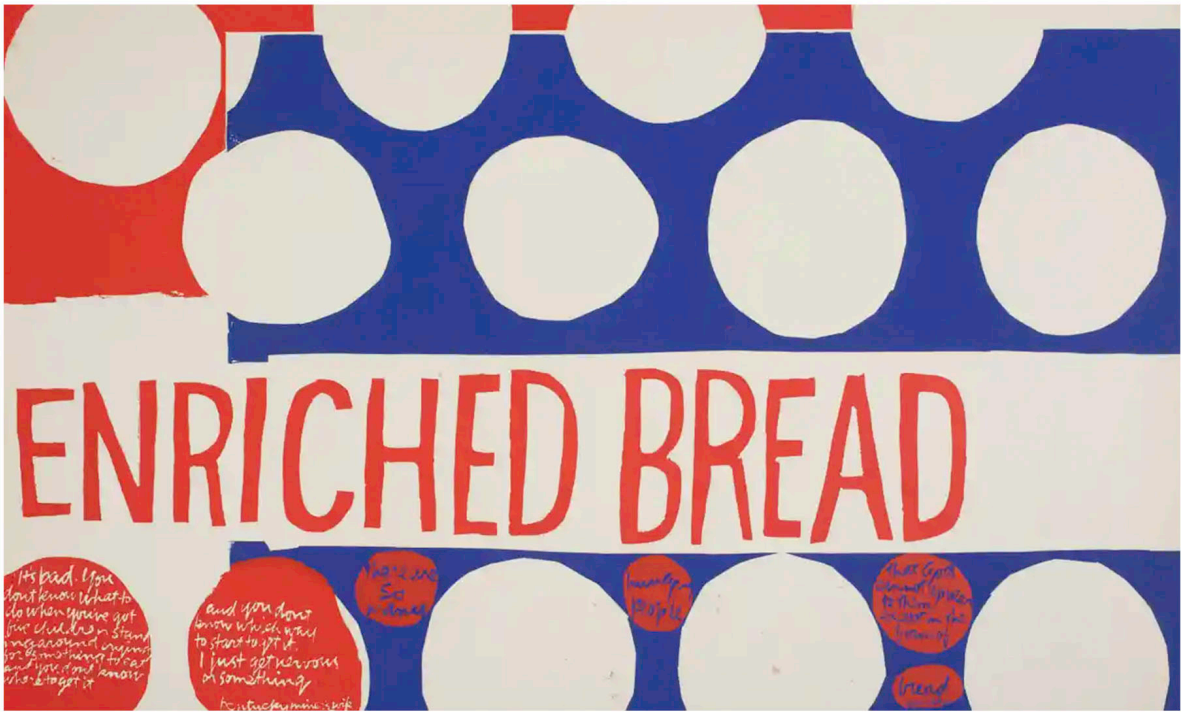
THERE ARE NUMEROUS EXAMPLES OF SMALL AND MEDIUM-SCALE GRAIN FARMERS WHO HAVE SUCCESSFULLY TRANSITIONED AT LEAST IN PART TO ORGANIC PRACTICES. THEIR PROFITABILITY IS LINKED TO THE 2-3X PRICE PREMIUM FOR FOOD-GRADE WHEAT OVER CONVENTIONAL WHEAT SOLD ON THE COMMODITY MARKET (REAVES ET AL., 2019). SMALL ORGANIC GRAIN FARMS CITE ETHICAL AND ENVIRONMENTAL CONCERNS AS THEIR PRIMARY MOTIVATIONS FOR THE ORGANIC TRANSITION, AND MID-SIZED FARMS SITE ECONOMIC MOTIVATIONS AND ARE LESS LIKELY TO REMAIN COMMITTED THROUGH MARKET FLUCTUATIONS (REAVES ET AL., 2019).

THERE ARE FEW EXAMPLES OF LARGE FARMS IN THE U.S. WHO HAVE SUCCESSFULLY IMPLEMENTED ORGANIC WHEAT GROWING. IN PART, IT IS DIFFICULT TO APPLY THE LABOR-INTENSIVE PRACTICES THAT ARE FEASIBLE AT SMALLER SCALES, AND THE SUBSEQUENT YIELDS REPRESENTED IN SMALL WHEAT OPERATIONS ARE UNLIKELY TO TRANSLATE AT SCALE (DÖRING AND NEUHOFF, 2021).

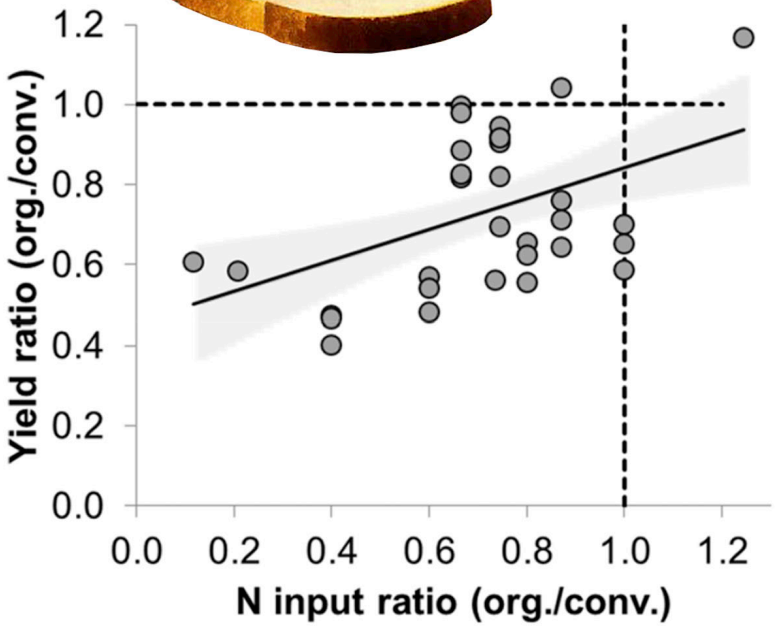
IN CENTRAL SOUTH DAKOTA, GUNSMOKE FARMS, A 53 SQUARE MILE PROPERTY (34,000 ACRES) WAS IMPLEMENTING A FULL CONVERSION TO ORGANIC PRACTICES. GENERAL MILLS, THE MULTINATIONAL FOOD CONGLOMERATE, SIGNED A "STRATEGIC SOURCING AGREEMENT" WITH TPG SIXTH STREET PARTNERS, A PRIVATE GLOBAL INVESTMENT COMPANY BASED IN SAN FRANCISCO, TO FACILITATE THE TRANSITION AND PROVIDE ORGANIC WHEAT AND PEAS FOR ITS ORGANIC BRANDS (ANNIE'S, LÄRABAR, CASCADIAN FARM, AND ORGANIC CEREALS UNDER OTHER BRAND NAMES) (JOHNSON, 2022). THEY IN-TURN HIRED A SERIES OF MANAGERS TO RUN THE OPERATIONS (CHARLES, 2021).

WHILE MOST FARMERS IN THE REGION USE NO-TILL, HERBICIDE-BASED FARMING PRACTICES TO MANAGE THE FRAGILE, CLAY-RICH TOPSOIL, THAT IS NOT AN OPTION UNDER ORGANIC CERTIFICATION (CHARLES, 2021) (TAUTGES ET AL., 2022). GENERAL MILLS IMAGINED THIS FARM AS AN "EDUCATIONAL HUB TO TEACH FARMERS HOW TO IMPLEMENT ORGANIC AND REGENERATIVE AGRICULTURE PRACTICES" (CHARLES, 2021). BUT UPON FIRST TILLAGE IN 2020, LOCALS NOTED DRIFTS OF WIND-BLOWN SOIL IN DITCHES AND DUST CLOUDS BLOWING OFF THE MASSIVE FIELDS — AND DESCRIBED IT AS IRREPARABLE HARM TO THE SOIL. AS OF 2023, ALL 34,000 ACRES ARE AVAILABLE THROUGH PEOPLES COMPANY (A FARMLAND-BROKERAGE AND MANAGEMENT COMPANY), WHO ARE "SEEKING LEASE PROPOSALS FROM QUALIFIED OPERATORS INTERESTED IN DRYLAND CROP PRODUCTION" (PEOPLES COMPANY, N.D.).





THAT THEY MAY HAVE LIFE,
CORITA KENT, 1964,
SCREEN PRINT ON PAPER
LOS ANGELES, CALIFORNIA, USA



DEPENDENCE OF THE ORGANIC:CONVENTIONAL YIELD RATIO ON NITROGEN INPUT. BASED ON DATA COMPILATION BY PONISIO ET AL. CASES RESTRICTED TO THOSE WHERE N INPUT WAS 120-150 KG N HA-1 IN CONVENTIONAL SYSTEM.

SOIL DRIFTING OVER A HOG HOUSE IN SOUTH DAKOTA, USA 1935.
YEARS OF EXTREME DROUGHT AND INTENSIVE FARMING
CAUSED SIGNIFICANT WIND EROSION OF TOPSOIL.

GOOD BREAD'S AGRARIAN UTOPIAS

TO SUGGEST ALTERNATIVES TO THE WAYS WE USE LAND, GROW WHEAT, AND BAKE BREAD IS TO ENGAGE IN SPECULATIVE FUTURE BUILDING. "UTOPIA," FIRST COINED IN 1516 BY THOMAS MORE IN HIS BOOK OF THE SAME NAME, PRESENTS AN INHERENT AMBIGUITY. THE WORD CAN BE MEANT TO EITHER REPRESENT AN "IDEAL NON-EXISTENT PLACE (*OU-TOPIA*) OR A PLACE OF FELICITY AND HAPPINESS (*EU-TOPIA*)" (DUTTON AND HOWLAND, 2019) (GOODE, 2022). THE IMAGINING OF AN AGRICULTURAL UTOPIA IS DEPENDENT ON WHO IS DOING THE IMAGINING. IN THE WEST, AND ESPECIALLY IN THE UNITED STATES, AGRICULTURAL UTOPIAS ARE SITUATED IN HISTORY OF "AGRARIAN SENTIMENTALITY" BEGINNING WITH THOMAS JEFFERSON, AND PERPETUATED BY POPULAR WRITERS LIKE WENDELL BERRY, BARBARA KINGSOLVER, AND MICHAEL POLLAN (BOBROW-STRAIN, 2013)(GOODE, 2022). AMERICAN SUSTAINABILITY RHETORIC POSITIONS ITSELF WITH THE PERSPECTIVE THAT A RETURN TO RURAL SIMPLICITY, LOCAL ECONOMIES, AND SELF-SUFFICIENCY IS THE SOLUTION, OVER ADVANCEMENTS IN TECHNOLOGY (THAT OF COURSE GOT US INTO THESE PROBLEMS IN THE FIRST PLACE)(GOODE, 2022).

ABBY L. GOODE WRITES IN HER 2022 BOOK, *AGROTOPIAS*, THAT THIS PROGRESSIVE LINE OF THINKING IS DEEPLY ROOTED IN CONSERVATIVE IDEOLOGIES SURROUNDING PERSONAL SOVEREIGNTY, HONEST LABOR, AND AN ANTHROPOCENTRIC DUTY TO USE AND IMPROVE THE LAND. WORDS LIKE "SUSTAINABLE" AND "REGENERATIVE" CAN OFTEN OBSCURE MORE THAN THEY REVEAL ABOUT OUR UTOPIAN SPECULATION, TENDING TO BE VAGUE, HUMAN-FOCUSED, AND EASILY CO-OPTED BY CORPORATIONS (GOODE, 2022). MORE RECENTLY, SUSTAINABILITY RHETORIC HAS BEEN REINTERPRETED WITHIN THE DIGITAL SPHERE THROUGH PLATFORMS LIKE YOUTUBE, INSTAGRAM, TIKTOK, AND PINTEREST. ONLINE, RURAL AND AGRICULTURAL LIFESTYLES BECOME ROMANTICIZED AND SANITIZED THROUGH HOMESTEADING BLOGS, COTTAGE-CORE AND FARM-CORE AESTHETICS, AND YES, THE REEMERGENCE OF AT-HOME SOURDOUGH BAKING.

ALTERNATIVE FOOD MOVEMENTS, AS AARON BOBROW-STRAIN POINTS OUT IN HIS BOOK, *WHITE BREAD: A SOCIAL HISTORY OF THE STORE-BOUGHT LOAF*, IS OFTEN SEEN TO BE AN AFFLUENT WHITE PROJECT. ONE WHERE THE NARRATIVE BECOMES "IF ONLY 'WE' COULD BRING THE VIRTUOUS SPIRIT OF GOOD FOOD TO 'THEM,' EVERYTHING WOULD BE OKAY" (BOBROW-STRAIN, 2013). RATHER, IT IS IMPORTANT INTERROGATE WHAT GOOD FOOD IS AND WHO HAS ACCESS TO IT.

IN THE 1960S, BAKING DARK, DENSE LOAVES OF BREAD IN THE EUROPEAN TRADITION— BECAME A REJECTION OF THE ASSIMILATION OF WHITE, HOMOGENOUS AMERICAN CULTURE THAT REACHED ITS ZENITH IN THE 50'S. TO THE COUNTERCULTURE, WHITE BREAD BECAME A SYMBOL FOR THE AILMENTS WITHIN SOCIETY, AND THE SOLUTION WAS SMALL COMMUNITIES BAKING THEIR OWN BREAD. BOBROW-STRAIN PICKS AT THIS CONCLUSION,

> MANY CRITICS IN THE AMERICAN AGRARIAN TRADITION…OFFER SMALL COMMUNITIES AS THE ANTIDOTE. THE STATEMENT NEVER CLARIFIES EXACTLY HOW SMALL COMMUNITIES BAKING THEIR OWN BREAD MIGHT SIDESTEP THE CAPITALIST SYSTEM — HISTORICALLY THEY RARELY HAVE, EVEN ON THE REMOTE FRONTIER — BUT IT WAS A POWERFUL VISION…TO BAKE WAS TO STAND APART FROM THE SYSTEM. (BOBROW-STRAIN, 2013)

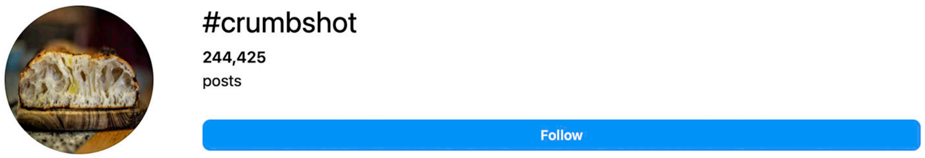
THE IMAGE OF GOOD BREAD HAS CHANGED OVER TIME—FROM THE CAKEY, ENRICHED WHITE BREAD OF THE EARLY 20TH CENTURY, TO THE COUNTERCULTURAL WHOLE WHEAT LOAVES OF THE SECOND HALF OF THE 20TH CENTURY, TO A STRANGE AMALGAM OF THE TWO IN THE WHITE, AIRY ARTISAN SOURDOUGH LOAVES THAT HAVE BECOME THE FIXATION OF HOME BAKERS IN THE 21ST CENTURY. THESE LOAVES SIMULTANEOUSLY HARNESS THE COMPLEXITY OF FERMENTATION AND ARE FUNDAMENTALLY ROOTED IN THE INSATIABLE AGRIBUSINESS OF COMMODITY WHEAT. IN THAT PROCESS, THE GESTURE OF BREAD BAKING, WHICH FOR THE 60'S COUNTERCULTURE REPRESENTED ON OVERT POLITICAL ACT, HAS BEEN STRIPPED OF ITS SOCIAL CRITIQUE — IN THE SAME WAY THAT DEFINITIONS OF SUSTAINABILITY, NATURALNESS, AND REGENERATION HAVE BEEN DE-TOOTHED BY THEIR OVER AND MISUSE BY CORPORATIONS. WHAT IS LEFT FOR THE HOBBY BAKER IS A CHIMERA — A LOAF WITH THE HEAD OF COMMODITY WHEAT AND THE TAIL OF THE COUNTERCULTURAL MOVEMENT.

THE LURE OF LOCAL GRAINS

WHILE THE UNITED STATES HAS THE MOST ARABLE LAND OF ANY NATION, AVAILABILITY OF ARABLE LAND READY TO TRANSITION TO LONG-TERM ORGANIC STAPLE PRODUCTION IS UNEQUALLY DISTRIBUTED ACROSS THE GLOBE. NATIONS WITH HIGH POPULATION DENSITIES AND LITTLE AVAILABLE ARABLE LAND (INDONESIA AND INDIA FOR EXAMPLE) CANNOT SOLELY RELY ON LEGUME FIXATION WITHOUT A SIGNIFICANT HIT TO PRODUCTION (DÖRING AND NEUHOFF, 2021). WHEN CONSIDERING THE CONSTRUCTION OF LOCAL FOOD ECONOMIES, IT IS IMPORTANT TO RECOGNIZE THAT LARGE REGIONS OF THE COUNTRY DO NOT GROW SIGNIFICANT QUANTITIES OF WHEAT (ESPECIALLY WHEAT THAT IS SUITABLE FOR BREAD), AND YET, IN SOME PART, RELY ON LARGELY RURAL MONOCULTURES FOR THEIR CALORIES. THIS ISSUE WILL ONLY BECOME MORE STARK AS OUR POPULATION BECOMES INCREASINGLY URBANIZED. APPROXIMATELY 83% OF THE U.S. POPULATION LIVES IN URBAN AREAS — UP FROM 64% IN 1950, AND THE GLOBAL URBAN POPULATION IS PROJECTED TO GROW 68% BY 2050 (CENTER FOR SUSTAINABLE SYSTEMS, 2021).

RESEARCHERS POSIT THAT THE HUMAN POPULATION NOW "EXCEEDS THE CARRYING CAPACITY OF AGRICULTURAL SYSTEMS THAT EXCLUSIVELY DEPEND ON LEGUMES FOR N INPUT AND THAT A SIZABLE PERCENTAGE OF THE WORLD POPULATION DEPENDS ON MINERAL N-FERTILIZERS" (DÖRING AND NEUHOFF, 2021). SO SQUEEZED BETWEEN THE UNSUSTAINABILITY AND ENVIRONMENTAL DEGRADATION OF SYNTHETIC NITROGEN FERTILIZERS AND THE LIMITS ON FOOD PRODUCTION INHERENT IN AN ORGANIC SYSTEM, WHAT ARE WE TO DO? SOME OF THE ANSWERS COME IN THE FORM OF BREEDING PROGRAMS, IMPROVED CROP ROTATIONS, DEVELOPMENT OF GRAIN INFRASTRUCTURE, AND IMPLEMENTION OF REGIONALLY SPECIFIC FARMING PRACTICES (JONES, 2012)(REAVES ET AL., 2019)(TAUTGES ET AL., 2022).

FOR STEPHEN JONES, "THE ANSWER HERE, TOO, IS LOCAL GRAINS. FOOD, FEED, AND MALT ARE RETURNING TO OUR LOCAL COMMUNITIES IN WAYS THAT MAKE SENSE AND THAT BENEFIT NOT ONLY THOSE WHO ENJOY REGIONAL FLAVORS BUT, MORE IMPORTANT, LOCAL ECONOMIES (JONES, 2012)." JONES COMPLICATES THIS PERSPECTIVE IN RESEARCH TITLED: *ADDRESSING THE CHALLENGES OF NEW DECENTRALIZED FLOUR MILLS IN*



THE "CRUMB SHOT" WAS POPULARIZED ON SOCIAL MEDIA PLATFORMS. BREAD BAKERS SLICE THEIR LOAF IN HALF TO SHOW OFF THE RORSCHACHIAN INTERIOR TEXTURE. IT HAS BECOME A VISUAL PROXY FOR QUALITY. THERE ARE NEARLY A QUARTER MILLION INSTAGRAM POSTS THAT UTILIZE THE HASHTAG.

ALTERNATIVE AGRICULTURE AND FOOD SYSTEMS, WHERE THEY FOUND THAT MIXING GRAIN FROM MULTIPLE, VARYING GROWING CONDITIONS STABILIZED AND IMPROVED OVERALL WHEAT QUALITY (ECONOPOULY AND JONES, 2020). THIS IS CHALLENGING FOR THE SMALL GRAIN MARKETS WHO'S BRANDING RELIES ON THE DIFFERENTIATION OF PRODUCT THROUGH LOCALITY. CONVERSELY, THE NATURAL CONCLUSION OF MIXING GRAINS FROM MULTIPLE SOURCES IS THE SYSTEM WE ALREADY HAVE — UNDIFFERENTIATED COMMODITY WHEAT.

WHILE THE BREEDING PROGRAM AT WSU'S BREAD LAB, AND THE DEVELOPMENT OF LOCAL, ORGANIC GRAIN ECONOMIES ACROSS THE COUNTRY ARE IMPORTANT FOR THE FUTURE RESILIENCE OF ORGANIC WHEAT PRODUCTION, IT EXISTS AT THE MARGIN OF HOW MOST PEOPLE GET MOST OF THEIR CALORIES. WHAT IS A LOCAL FOOD ECONOMY WHEN YOU ARE ONE OF THE 275.5 MILLION AMERICANS WHO LIVE AROUND URBAN CENTERS? EXPRESSIONS OF LOCALITY AND ALTERNATIVE FOOD MOVEMENTS CAN COME ACROSS AS DISTANT OR PERFORMATIVE TO THE DAILY REALITIES OF URBAN AND SUBURBAN POPULATIONS, AND THE FOOD INSECURITIES THAT MANY AMERICANS EXPERIENCE DAILY. BOBROW-STRAIN POINTS OUT THAT,

> WHILE DEFENDERS OF INDUSTRIAL FOOD PRODUCTION CAN MAKE EASY SPORT OF RICH LOCAVORES, THEY CONVENIENTLY IGNORE THE FAR GREATER ELITISM OF OLIGOPOLY AGRIBUSINESS, AND THE MYRIAD WAYS IN WHICH THE DREAM OF INDUSTRIAL PLENTY OFTEN MADE LIFE WORSE, NOT BETTER.
> (BOBROW-STRAIN, 2013)

IN *THE LURE OF THE LOCAL, LUCY LIPPARD* NOTES THAT, "THESE DAYS THE NOTION OF THE LOCAL IS ATTRACTIVE TO MANY WHO HAVE NEVER REALLY EXPERIENCED IT, WHO MAY OR MAY NOT BE WILLING TO TAKE RESPONSIBILITY AND STUDY THE LOCAL KNOWLEDGE THAT DISTINGUISHES EVERY PLACE FROM EVERY OTHER PLACE" (1997). OVEREMPHASIZING LOCALITY IN FOOD SYSTEMS CAN ONCE AGAIN ACCENTUATE INGRAINED SYSTEMS OF POWER AND OPPRESSION, WHEN WE DELINEATE WHERE AND WHO IS PART OF OUR LOCALITY, AND THEREFORE DESERVING OF OUR DOLLARS AND ATTENTION. THIS FIXATION ON LOCALITY ADDITIONALLY CAN LEAN TOWARDS NATIONALISM, IGNORING THE INTERCONNECTIVITY OF OUR GLOBAL ECONOMY THAT WAS LAID BARE THROUGHOUT THE COVID-19 PANDEMIC (GOODE, 2022). AS FOR GRAIN, THERE IS A REASON WHY BARBARA KINGSOLVER EXCLUDED IT FROM HER FAMILY'S YEAR-LONG PURSUIT OF LOCAL-ONLY EATING — UNLESS YOU LIVE IN WALLA WALLA, WICHITA, OR BISMARCK, IT IS DIFFICULT TO HAVE TRULY *LOCAL* GRAINS (KINGSOLVER ET AL., 2009).

WHAT I ARGUE FOR IS NEITHER PURITANIC ORGANIC, LOCAL, SMALL-SCALE AGRARIANISM, NOR IS IT TECHNOCRATIC, CORPORATE, RESEARCH-BASED SOLUTIONS BUT INSTEAD *DENSITY*. BY THAT I MEAN THAT WE CANNOT DRASTICALLY TRANSFORM THE AGRICULTURAL SYSTEM WITHOUT THE EXPECTATION THAT THE END RESULT OF THAT SYSTEM — THE FOOD WE EAT — DRASTICALLY CHANGES ALONG WITH IT. A NUMBER OF METANALYSES AND PRIMARY RESEARCH POINTS TO THIS SAME SOLUTION. REAVES ET AL. FROM THE SUSTAINABLE FOOD LAB DESCRIBES IN THEIR LIST OF SOLUTIONS A NEED TO, "INNOVATE IN THE DESIGN OF NOVEL FOOD PRODUCTS AND COLLABORATION ACROSS THE FOOD AND FEED SECTOR TO CREATE MARKET PULL FOR MORE DIVERSE ROTATIONS" (REAVES ET AL., 2019). DÖRING AND NEUHOFF'S *UPPER LIMITS TO SUSTAINABLE ORGANIC WHEAT YIELDS* NOTES THAT, "APPROACHES TO MEET THE CURRENT AND FUTURE DEMAND FOR CALORIES AND PROTEIN ARE LIKELY TO DEPEND ON ADJUSTING CONSUMING BEHAVIOR WITH RESPECT TO DIETARY PATTERNS" (2021).

FOR WHEAT, THAT MEANS THAT THE BREAD WE BAKE AND OUR IMAGINATION OF "GOOD BREAD" NEEDS TO BECOME "GOOD *ENOUGH* BREAD." IF THERE ISN'T ENOUGH ARABLE LAND TO GROW ORGANIC BREAD-QUALITY WHEAT, AND WE CANNOT CONTINUE FABRICATING NITROGEN TO BAKE WITH, I HOPE WE CAN SETTLE FOR DENSER BREAD THAT RESPECTS THE WHOLE GRAIN AND THE WHOLE LAND. IT'S NOT THAT THE PROTEIN CONTENT OF THE WHEAT ISN'T SUITABLE FOR BREAD, BUT THAT THE BREAD ISN'T SUITABLE FOR AGRICULTURAL SYSTEMS WE HOPE TO ACHIEVE. IT IS AN ARGUMENT FOR AN AGRICULTURAL SYSTEM-WIDE SNOUT-TO-TAIL KIND OF EATING THAT INCLUDES ALL OF THE CROPS THAT BRING ABOUT PRODUCTIVE FARMING PRACTICES—LEGUMES FOR FIXING NITROGEN, GRAIN CROPS THAT ARE APPROPRIATE TO THE REGION, OIL SEED CROPS WITH DEEP TAPROOTS FOR WATER RETENTION, AND A RETURN OF ANIMALS TO THE LAND TO PROVIDE MANURE AND NUTRIENT CYCLING (DELATE, 2013)(REAVES ET AL., 2019). COOKS, BAKERS, AND EATERS OF ALL KINDS NEED TO BE MALLEABLE TO CHANGE — TO ADJUST EXPECTATIONS AND MAKE DECISIONS WHOSE "AGGREGATE CONSEQUENCE… IS THE CONTINUOUS RESHAPING OF THE WORLD TO REFLECT OUR PREFERENCES (FLOOD ET AL., 2019)."

THE COOK AS CARTOGRAPHER

EVERY DAY WE ASK OURSELVES, AND PERHAPS THOSE AROUND US, "WHAT SHOULD WE EAT TODAY?" AND IN ANSWERING THAT QUESTION, WE ARE NOT ONLY IMAGINING WHAT TO FILL OUR STOMACHS WITH, BUT ADDITIONALLY DECIDING HOW WE WANT TO SEE THE WORLD REFLECTED BACK AT US. AS CATHERINE FLOOD AND MAY ROSENTHAL SLOAN POINT OUT IN THE INTRODUCTION TO *FOOD: EATING TOMORROW*,

> WHEN YOU SIT DOWN TO EAT, YOU ARE ENGAGING WITH SOMETHING FAR MORE COMPLEX THAN SIMPLY A MEAL WAITING TO BE TASTED AND DIGESTED. THE FOOD WE EAT CONNECTS US EVERY DAY TO THE INTERNAL WORKINGS OF OUR OWN BODIES, TO OTHER PEOPLE IN OUR COMMUNITIES AND IN WIDER SOCIETY, TO THE ECONOMY, TO GLOBAL POLITICS, AND TO THE NATURAL WORLD (2019).

THROUGH THIS VISUALIZATION WE CREATE "GUSTATORY MAPS" THAT SHAPE NUTRITION AND DIETS, BUT ALSO POLITICS AND ECOLOGY (ARZAK, 2018). GUSTATORY MAPS ARE FORMED AND REINFORCED EARLY ON THROUGH "THE ENJOYMENT OF RECOGNIZABLE FOOD (FAMILY, SCHOOL, NEIGHBORHOOD, AND WORK)" (ARZAK, 2018). THEY ARE FURTHER INFLUENCED BY SOCIOECONOMIC STATUS, AND INCREASINGLY BY THE CHOICE ARCHITECTURE OF GLOBALIZED INDUSTRIAL FOOD SYSTEMS.


Excellent. Just right.

ONE OF MY EARLIEST MEMORIES OF WRITING WAS TRANSCRIBING A RECIPE FOR CINNAMON ROLLS FROM A LIBRARY BOOK AT MY ELEMENTARY SCHOOL SO I COULD BAKE IT WHEN I GOT HOME. IT FEELS APPROPRIATE THAT FOR ME TO FULLY FORMULATE THESE CONCEPTS ABOUT WHEAT, THEY MUST COME IN THE FORM OF RECIPES. THE RECIPES I HAVE INCLUDED IN THE COMING PAGES — ONE FOR MAC AND CHEESE WITH PEAS, TWO FOR AIOLI, AND THREE FOR BREAD — ARE PIVOTAL FOODS IN MY OWN GUSTATORY MAP. I HAVE INCLUDED THEM HERE AS EACH EMBODY AN ASPECT OF THE CONVERSATION ABOUT NITROGEN, WHEAT, AND BREAD THAT I HAVE EXPLORED IN MY WRITING. IN SOME SMALL WAY, I HOPE THAT THEY BECOME TOUCHSTONES IN YOUR OWN IMAGININGS OF GOOD FARMING PRACTICES AND GOOD BREAD.

RECIPES, LIKE THE SCIENTIFIC RESEARCH I HAVE CITED THROUGHOUT THIS BOOK, ARE ULTIMATELY ABSTRACTIONS — A SUMMATION OF PAST EVENTS, WITH THE EXPECTATION THAT IF ALL OF THE CONDITIONS ARE REPLICATED WITH PRECISION, YOU TOO WILL COME AWAY WITH THE SAME RESULTS. RECIPES AND RESEARCH ARE THEN MAPS THAT ARE CONSTRUCTED TO EXPRESS OUR UNDERSTANDING OF THE WORLD AS WE EXPERIENCE IT. IN JORGE LUIS BORGES' SHORT STORY *ON EXACTITUDE IN SCIENCE*, CARTOGRAPHERS, DISSATISFIED WITH THE INACCURACIES OF THEIR MAPS, SET OUT TO CREATE A "MAP OF THE EMPIRE WHOSE SIZE WAS THAT OF THE EMPIRE, AND WHICH COINCIDED POINT FOR POINT WITH IT." FUTURE GENERATIONS, WHO FOUND ITS PERFECTION USELESS, ABANDONED THOSE MAPS TO THE "INCLEMENCIES OF SUN AND WINTERS" (BORGES, 1946).

THE MAPS I HAVE DRAWN CAN ONLY BEGIN TO DESCRIBE THE LANDSCAPE, AND EACH SITE MARKED WITH "TERRA INCOGNITA" IS AN OPPORTUNITY FOR JOYFUL UNCERTAINTY. I CAN GUARANTEE THAT RESULT WILL VARY WITH THE RECIPES IN THIS BOOK, ESPECIALLY AS THEY ARE COLLABORATIONS WITH THE UNRULY ECOLOGY OF FERMENTATION. IN FACT, RESEARCH INDICATES THAT SOURDOUGH STARTERS (WHICH ARE A CENTRAL COMPONENT TO THE THREE BREADS INCLUDED) TAKE ON THE BACTERIAL AND FUNGAL PROFILES ON AND IN THE GRAINS USED, BUT ALSO FROM THE HANDS OF THE BAKER (REESE ET AL., 2020). THESE MICROORGANISMS AFFECT THE FLAVORS, AROMAS, AND EVEN NUTRITIONAL CONTENT OF THE RESULTING BREAD. MOREOVER, THIS RELATIONSHIP IS RECIPROCAL. THE STARTERS INOCULATE THE BODY OF THE BAKER WITH A HIGHER CONCENTRATION OF LACTOBACILLUS AND YEASTS THAN A NON-BAKER, AS IF IN MAKING BREAD, THE BREAD IS IN TURN MAKING YOU (REESE ET AL., 2020). APPROACHING BREAD THROUGH THE LENS OF THIS SYMBIOTIC RELATIONSHIP, NOTIONS OF AMBIGUITY, COMPROMISE, AND CONTRADICTION EMERGE (BOBROW-STRAIN, 2013). RATHER THAN A TOP-DOWN VIEW OF YEASTS, WHEAT, AND LAND AS ENTITIES TO CONTROL AND EXTRACT QUALITY, PURITY, AND NATURALNESS FROM, AGAIN "GOOD BREAD" BECOMES BREAD THAT IS GOOD *ENOUGH*.

RECIPES ARE WRITTEN WITH AS MANY GUIDEPOSTS AS THE AUTHOR DEEMS NECESSARY. FOR PETER SCHUMANN'S RYE RECIPE, HE DESCRIBES IT IN GALLONS OF THIS, GALLONS OF THAT, *HOCUS POCUS*, AND YOUR BREAD COMES OUT EXACTLY AS IT WAS INTENDED, NO MATTER WHAT. SCHUMANN REACTS TO THE ENVIRONMENTAL CONDITIONS AROUND AND IN THE BREAD, BUT DOES SO THROUGH INKLINGS RATHER THAN INSTRUCTIONS. THIS IS A RECIPE BORN IN THE 1960'S COUNTERCULTURE THAT BREAD AND PUPPET EMERGED FROM, AND IN PART, HAS EXISTED WITHIN EVER SINCE. SCHUMANN'S GUSTATORY MAP IS FORMED BY HIS EXPERIENCE OF POST-WAR "REFUGEEDOM" IN GERMANY AS A YOUNG MAN, AND THAT UNCERTAINTY AND ADAPTABILITY IS EVIDENT IN HIS BREADS.

IN MY *UNAUTHORIZED* REPRINTING OF MAURIZIO LEO'S "PERFECT LOAF" YOU WILL SEE THAT HE PROVIDES AN OVERWHELMING AMOUNT OF SPECIFICITY THAT MIGHT SPEAK TO A BAKER LOOKING TO CONTROL ALL ASPECTS OF THEIR BREAD. LEO HAS MANY WHOLE-GRAIN BREAD RECIPES THAT I HAVE COME TO LOVE OVER THE YEARS, BUT HIS WORK WITHIN THE REALM OF ARTISAN, BREAD FLOUR-BASED SOURDOUGH IS WHAT MADE HIS WORK POPULAR. LIKE IT'S TECHNICAL PREDECESSORS — THE NEW YORK TIMES *NO-KNEAD RECIPE* ("ONE OF THE MOST POPULAR RECIPES THE TIMES HAS EVER PUBLISHED" WITH 17,700 5-STAR REVIEWS), KEN FORKISH'S *FLOUR, WATER, SALT, YEAST*, AND CHAD ROBERTSON'S *TARTINE BREAD*, THIS BREAD IS BEHOLDEN TO THE NITROGEN-INTENSIVE AGRICULTURAL SYSTEMS THAT I HAVE LAID OUT (LÓPEZ-ALT, 2021). THE PERFECT LOAF'S "MY BEST BREAD", AND ALL THOSE IN PURSUIT OF A HOLIER AESTHETICIZED BREAD ARE REITERATING AN INDUSTRIAL, MONOCULTURAL PROCESS — TO CAPITALIZE EVERY LAST BIT OF EXTENSIBILITY, LOFTINESS, AND OPEN CRUMB FROM THE FLOUR, AND BY PROXY THE LAND IT IS GROWN ON.

THE RECIPE OF MY OWN CREATION IS A SEEDED SUNFLOWER BREAD BASED ON A LOAF I MADE DAILY WHILE WORKING AT GRANO BAKERY AND MARKET IN OREGON CITY, OREGON, AND TWEAKED AND ADJUSTED DURING MY OWN PANDEMIC BAKING RENAISSANCE. AT GRANO, THE BREAD WAS CALLED *VOLKORNBROT* (GERMAN FOR WHOLE-GRAIN OR BROWN BREAD) BUT I FOUND MYSELF CONSTANTLY MISSPELLING AND MISPRONOUNCING IT AS *VOLKENBROT*, WHICH TRANSLATES INSTEAD TO "PEOPLE OR FOLK BREAD." THIS IS A MORE FITTING NAME FOR THE KIND OF BREAD I WANT TO PERPETUATE — BREAD THAT IS RELATIONAL, COMMUNAL, AND ENCOURAGES A DIVERSITY OF ALIMENTARY JOY, OR AS MARTA ARZAK SAYS IN *COOKING AS ART OR THE ART OF COOKING*,

> THE SHARING OF A MEAL WITH ANOTHER OR OTHERS [IS WHAT] ELEVATES THE CHOICE AND PLEASURE OF EATING TO THE FORM OF OBLIQUE DIALOGUE. TO THOSE WE KNOW WELL, WE ARE ABLE TO GIVE PLEASURE PROVIDING THEM WITH DISHES THAT WE KNOW THEY LIKE. FOOD BECOMES A GIFT (2018).

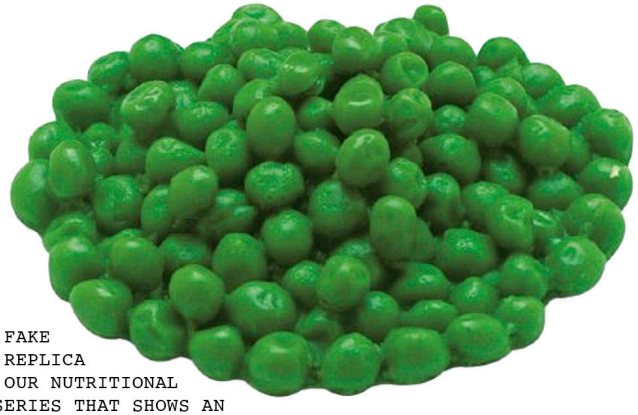
"WITHOUT MARKETS FOR WEED SUPPRESSING AND SOIL-BUILDING ROTATION CROPS, FARMERS ARE LESS LIKELY TO MANAGE MORE DIVERSE ROTATIONS TO ADDRESS FUTURE PRODUCTION CHALLENGES. NOVEL PRODUCTS LIKE ANNIE'S MAC AND CHEESE MADE WITH ORGANIC WHEAT AND NITROGEN-FIXING PEA CROPS ARE BEGINNING TO PROVIDE A SOLUTION."

(REAVES ET AL.,2019)

CROP ROTATION
MAC AND CHEESE

SUGGESTED RECIPE FOR ANNIE'S SHELLS & WHITE CHEDDAR.

BOIL 8 CUPS OF H2O
STIR IN:
2 BOXES OF ANNIE'S ORGANIC SHELLS



1/2 CUP OF FAKE PEAS: THIS REPLICA IS PART OF OUR NUTRITIONAL EDUCATION SERIES THAT SHOWS AN APPROPRIATE PORTION SIZE IN TEACHING NUTRITIONAL INSTRUCTION.

COOK UNTIL SOFT
STIRRING OCCASIONALLY
DRAIN IN COLANDER

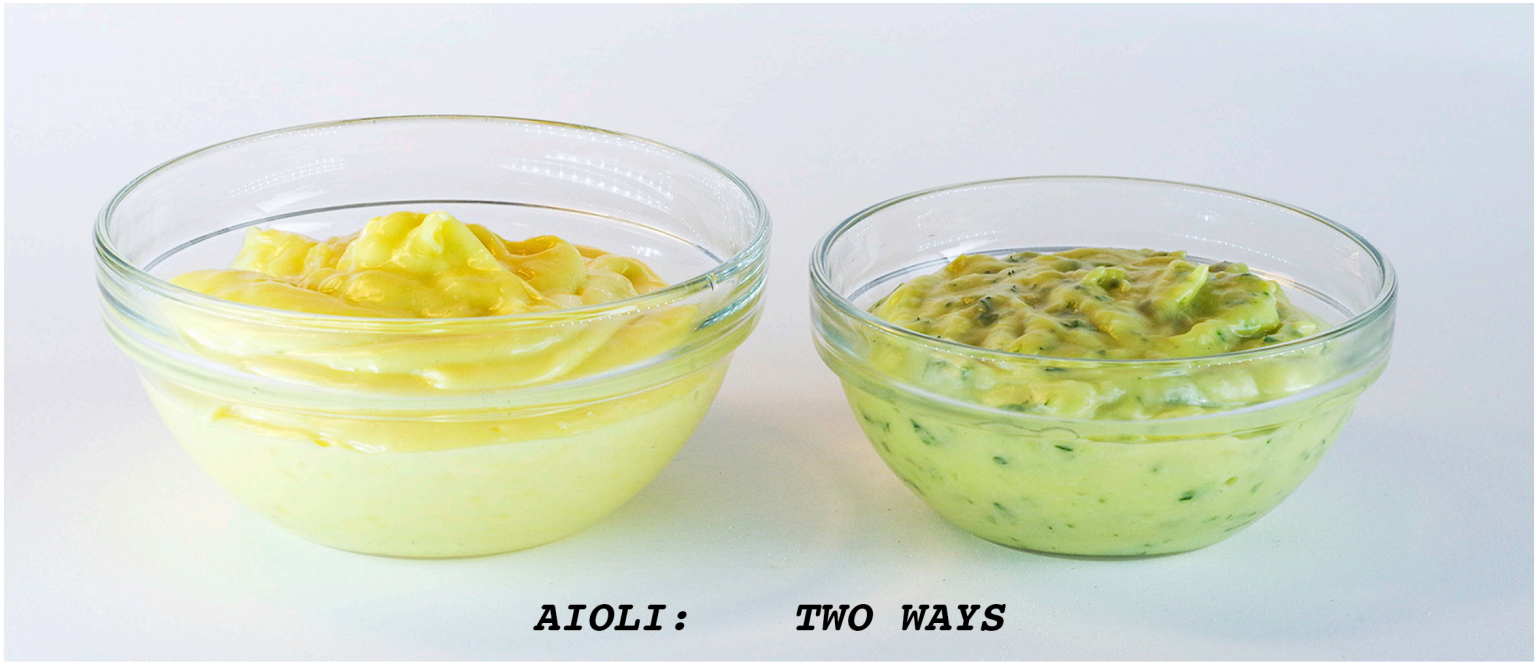
TO THE EMPTY SAUCEPAN
ON LOW HEAT ADD:
3 TBS OF BUTTER

ONCE MELTED ADD:
1/4 CUP WHOLE MILK
WHISK IN BOTH CHEESE PACKETS
INTEGRATE PASTA

ADD:
1 CUP GRATED SHARP CHEDDAR CHEESE
1 CUP FROZEN PEAS
1 TBSP CHOPPED HERBS
1/2 TSP RED PEPPER FLAKES

A 1920'S STEREOVIEW OF CATTLE AT THE UNION STOCK YARDS IN CHICAGO, ILLINOIS, USA "LARGEST LIVE STOCK MARKET ON EARTH."

INTERCROPPED SPRING PEA AND SPRING WHEAT IN THE PALOUSE REGION OF THE INLAND PACIFIC NORTHWEST, USA



AIOLI: TWO WAYS

1 EGG YOLK
1/2 TSP H2O

IN A BOWL NESTLED IN A KNOTTED KITCHEN TOWEL
ADD YOLK AND WATER
WHISK CONSTANTLY WHILE ADDING OIL MIX DROP BY DROP UNTIL INTEGRATED

1/2 CUP CANOLA OIL
1/2 CUP OLIVE OIL

*IF EMULSION SPLITS, START AGAIN WITH NEW YOLK, INTEGRATING SPLIT MIX

ADD:
SALT TO TASTE
2 CLOVES OF GRATED GARLIC
H2O TO DESIRED CONSISTENCY

10 CLOVES OF SMASHED GARLIC
1/2 TSP SALT
1 TSP LEMON JUICE

SMASH INGREDIENTS INTO A PASTE WITH A MORTAR AND PESTLE
CONTINUE TO MIX, ADDING OIL DROP BY DROP
UNTIL INTEGRATED AND EMULSION FORMS

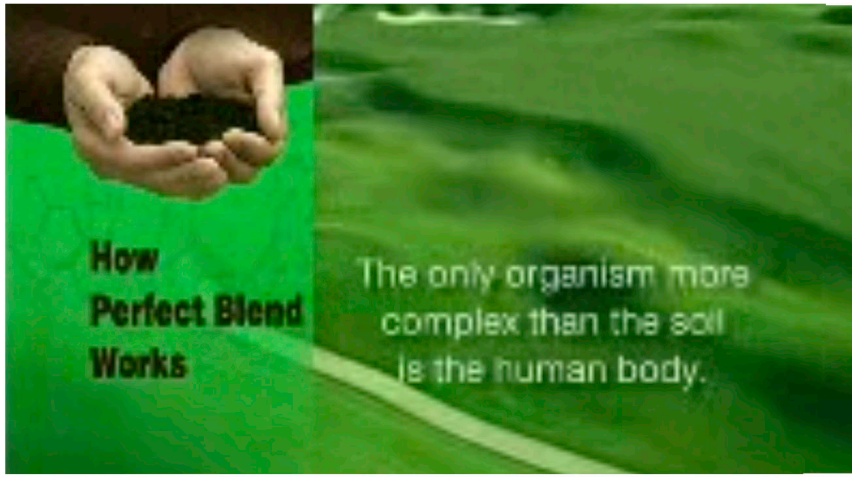
3/4 CUP CANOLA OIL

ADD:
1 TBSP OF CHOPPED HERBS
H2O TO DESIRED CONSISTENCY

BREAD AND PUPPET SHIFTED FROM AN EGG-BASED AIOLI TO A "CATELONIAN" STYLE DUE TO FOOD SAFETY CONCERNS AT THEIR SUMMER PERFORMANCES.

A FIELD OF CANOLA (MUSTARD FAMILY) IN THE PALOUSE REGION, WASHINGTON, USA. CANOLA CAN BE AN EFFECTIVE ROTATIONAL CROP WHERE LEGUMES ARE UNSUCCESSFUL. VIGOROUS WINTER GROWTH CAN OUTCOMPETE WEEDS, AND TAPROOTS OPEN UP TOPSOIL INCREASING WATER HOLDING CAPACITY. CANOLA DOES NOT PROVIDE NITROGEN FIXATION.

PROMOTIONAL VIDEO FROM PERFECT BLEND OTHELLO,WASHINGTON,USA.



Guaranteed Analysis

Total Nitrogen (N)	4.00%
0.40% Ammoniacal Nitrogen	
0.03% Nitrate Nitrogen	
1.50% Other Water Soluble Nitrogen	
2.07% Water Insoluble Nitrogen	
Available Phosphate (P_2O_5)	4.00%
Soluble Potash (K_2O)	4.00%
Calcium (Ca)	7.0000%
Magnesium (Mg)	0.7000%
0.70% Water Soluble Magnesium (Mg)	
Sulfur (S)	1.50%

Derived From:
Chicken Manure, Raw Fish, Elemental Sulfur, Sulfate of Potash.

ALSO CONTAINS NONPLANT FOOD INGREDIENTS

Soil Amending Ingredient:
5.00% Volcanic Ash

NUTRIENT BREAKDOWN OF PERFECT BLEND 4-4-4, DERIVED FROM CHICKEN MANURE, USING A PROPRIETARY METHOD TO CREATE "A HOMOGENOUS GRANULAR BLEND."

PETER SCHUMANN'S BREAD & PUPPET RYE

(*FROM ORAL DESCRIPTION IN SUSAN BETTMAN'S 2016 VIDEO + MY OWN MEMORY**)

1 GALLON OF RYE - MILLED FRESH
4 GALLONS OF SOURDOUGH
3 GALLONS OF SPROUTED RYE BERRIES
WHEAT FLOUR (?)
SALT (~2% OF FLOUR BY WEIGHT)
(*A SMALL BAKING*)

SOAK RYE BERRIES IN A JAR WITH A MESH SCREEN, RINSING TWICE A DAY FOR TWO DAYS

MIX THE SOURDOUGH AND RYE THE NIGHT BEFORE BAKING

ADD WHEAT AND SALT IN THE MORNING
KNEAD
REST FOR 3 HOURS
SHAPE INTO OBLONG LOAVES
REST
PLACE LOAVES IN A HOT OVEN
CLOSE DOOR
HOCUS POCUS
REMOVE WHEN READY

*I INTERPRETED THE WHEAT ADDED AS WHOLE WHEAT, WHICH RESULTED IN A FAR DENSER LOAF THAN THOSE PRODUCED AT BREAD AN PUPPET. IT MAINTAINED A SIMILAR FLAVOR PROFILE, BUT I BELIEVE THEY ARE USING AN ALL PURPOSE FLOUR FOR THEIR SCHUMANN-LITE RECIPES. EITHER WAY, FROM THE RECIPE PROVIDED, RESULT WILL VARY.

STAMPS WERE USED IN NORTHERN GERMANY
WHERE SCHUMANN WAS A REFUGEE.
BAKING WAS DONE IN COMMUNAL OVENS
AND EVERY FAMILY HAD A DISTINCT MARK
TO SIGNIFY THEIR LOAVES - NOT UNLIKE
CATTLE BRANDING TRADITIONS IN THE AMERICAN WEST.

A MASONITE RELIEF CUT BY SCHUMANN OF GRAIN GROWING FROM A BOOT.

NO PUPPET, NO PUPPET, YOU'RE THE PUPPET.

THE NAKED POPULATION PUPPETS (NICKNAMED "POTATO PEOPLE") ARE A RECURRING SET OF CHARACTERS IN BREAD AND PUPPET'S PERFORMANCES. PART SHIELD, PART BAS-RELIEF, THE HAND-PAINTED PAPIER-MÂCHÉ PUPPETS ARE HELD TWO PER PERSON, AND COME TO STAND IN FOR VARIOUS OPPRESSED PEOPLES, USUALLY IN OPPOSITION TO GROTESQUE CORPORATE AND GOVERNMENTAL EFFIGIES. AS DENISE ROGERS VALENZUELA, A FORMER B&P PUPPETEER AND PERFORMER RECOUNTS, "THEY MOST OFTEN PERFORM AS THE MASSES — A POPULATION OF ORDINARY PEOPLE — DIRECTLY OR INDIRECTLY ATTACKED BY AN OPPRESSIVE POWER THAT SEEKS THEIR DESTRUCTION. CONFRONTED BY SUCH VIOLENCE, THE PUPPETS OFTEN RESIST, FALL, AND RISE UP OR RESURRECT" (VALENZUELA, 2019).

BUILT FOR THE 1997 "OUR DOMESTIC RESURRECTION CIRCUS" PAGEANT, THE PUPPETS WERE ORIGINALLY FAR MORE DIMENSIONAL, BUT THROUGH TRANSPORTATION, STORAGE, AND HANDLING HAVE BECOME FLATTENED AND COMPRESSED OVER THE PAST 25 YEARS. VALENZUELA NOTES HOW, BY EMBODYING THE POTATO PEOPLE, THERE IS A RECIPROCAL RELATIONSHIP BETWEEN PERFORMER AND PUPPET — ONE THAT DISRUPTS THE VERTICAL POWER DYNAMICS BETWEEN SUBJECT AND OBJECT THAT ARE THE UNDERPINNINGS OF EXTRACTIVE CAPITALISM (VALENZUELA, 2019). THE SAME RECIPROCITY CAN EXIST WHEN BAKING, IF ONE CAN RECOGNIZE, THROUGH THE AMBIGUITY OF FERMENTATION, THAT THE BREAD AND THE BAKER ARE SHAPING EACH OTHER.

SOURDOUGH IS FICKLE WITH WEATHER. WHEN YOU GET THUNDERSTORMY, MUGGY WEATHER IT WANTS TO RUN AWAY FROM YOU.

THE PERFECT LOAF'S
MY BEST SOURDOUGH RECIPE

LEVAIN

30G MEDIUM-PROTEIN BREAD FLOUR
30G WHOLE WHEAT FLOUR
60G WATER
30G RIPE SOURDOUGH STARTER

MAIN DOUGH

822G BREAD FLOUR
64G WHOLE WHEAT FLOUR
745G WATER
17G SALT
151G RIPE LEVAIN

LEVAIN (9:00 A.M.)

IN A SMALL CONTAINER, MIX THE LEVAIN INGREDIENTS AND KEEP AT 78°F (25°C) FOR 5 HOURS.

AUTOLYSE (12:00 P.M)

IN A MEDIUM MIXING BOWL, ADD 822G MEDIUM-PROTEIN BREAD FLOUR, 64G WHOLE WHEAT FLOUR, 650G WATER, AND MIX UNTIL NO DRY BITS REMAIN. COVER THE BOWL AND LET REST FOR 2 HOURS.

THE ARTIST WORKING AS A BAKER IN 2018
AT THE NOW CLOSED GRANO BAKERY & MARKET
IN OREGON CITY, OREGON, USA
LOADING GOLDEN RAISIN EMMER LOAVES.
COOLING ON THE RACK ARE COUNTRY LOAVES
AND SESAME SEED DURUM LOAVES.

Flour Selection

I've tried a lot of flour out there (and am an avid user of **freshly milled flour**), indeed not everything there is, but I've ordered enough now that the UPS guy thinks I might have a bakery in my backyard. I have baked some great bread with Hayden Flour Mills (including **this wonderful white Sonora Sourdough bread**), Central Milling, and Giusto's. I've also had great success with King Arthur Baking flour.

I have consistently made incredible loaves with Giusto's flour; I only wish it was organic. Nevertheless, I find myself ordering a box of it here and there and enjoying the results every time. Of course, as I mentioned before, try whatever is local first (sadly, my source for local, organic flour is no longer) and what you like.

MAURIZIO LEO'S ASSESSMENT OF
THE BEST HIGH-GLUTEN BREAD
FLOURS TO USE IN THE "MY BEST
SOURDOUGH RECIPE."

THE NOW FAMOUS 2006 NEW YORK TIMES NO KNEAD BREAD RECIPE BY JIM LAHEY AND MARK BITTMAN. PETER REINHART, AUTHOR OF *THE BREAD BAKER'S APPRENTICE,* DESCRIBED IT AS "THE RECIPE THAT DEMOCRATIZED BREAD BAKING."

MIX (2:00 P.M.)

TO THE MIXING BOWL HOLDING YOUR DOUGH, ADD 95G WATER (HOLDING BACK ANY AS NECESSARY IF THE DOUGH IS TOO WET), 17G SEA SALT, AND THE RIPE LEVAIN (FROM STEP 1). TRANSFER YOUR DOUGH TO A BULK FERMENTATION CONTAINER AND COVER.

BULK FERMENTATION (2:15 P.M. TO 6:15 P.M.)

GIVE THE DOUGH 6 SETS OF STRETCH AND FOLDS. THE FIRST THREE SETS ARE AT 15-MINUTE INTERVALS, AND THE LAST THREE SETS ARE AT 30-MINUTE INTERVALS.

DIVIDE AND PRESHAPE (6:15 P.M.)

LIGHTLY FLOUR YOUR WORK SURFACE AND SCRAPE OUT YOUR DOUGH. USING YOUR BENCH KNIFE, DIVIDE THE DOUGH IN HALF. LIGHTLY SHAPE EACH HALF INTO A ROUND SHAPE. LET THE DOUGH REST FOR 30 MINUTES, UNCOVERED.

SHAPE (6:45 P.M.)

SHAPE THE DOUGH INTO A ROUND (BOULE) OR OVAL (BATARD) AND PLACE IT IN PROOFING BASKETS. COVER THE BASKETS WITH A REUSABLE PLASTIC BAG.

PROOF (7:25 P.M. TO 9:00 A.M. THE NEXT DAY)

COVER PROOFING BASKETS WITH REUSABLE PLASTIC AND SEAL THEM SHUT. THEN, PLACE BOTH BASKETS INTO THE REFRIGERATOR AND PROOF OVERNIGHT.

BAKE (PREHEAT OVEN AT 8:00 A.M., BAKE AT 9:00 A.M.)

PREHEAT YOUR OVEN WITH A COMBO COOKER OR DUTCH OVEN INSIDE TO 450°F (230°C). REMOVE YOUR DOUGH FROM THE FRIDGE, SCORE IT, AND TRANSFER IT TO THE PREHEATED COMBO COOKER. PLACE THE COOKER IN THE OVEN, COVER WITH THE LID, AND BAKE FOR 20 MINUTES. AFTER THIS TIME, REMOVE THE LID (YOU CAN KEEP IT IN THE OVEN OR REMOVE IT) AND CONTINUE TO BAKE FOR 30 MINUTES LONGER. WHEN DONE, THE INTERNAL TEMPERATURE SHOULD BE AROUND 208°F (97°C). LET THE LOAVES COOL FOR 2 HOURS ON A WIRE RACK BEFORE SLICING.

Time 1 hour 30 minutes, plus about 20 hours' resting time

Rating 5 ★★★★★ (17710)

Notes Read 2878 community notes ↴

Here is one of the most popular recipes The Times has ever published, courtesy of Jim Lahey, owner of Sullivan Street Bakery. It requires no kneading. It uses no special ingredients, equipment or techniques. And it takes very little effort — only time. You will need 24 hours to create the bread, but much of this is unattended waiting, a slow fermentation of the dough that results in a perfect loaf. (We've updated the recipe to reflect changes Mark Bittman made to the recipe in 2006 after publishing and receiving reader feedback. The original recipe called for 3 cups flour; we've adjusted it to call for 3⅓ cups/430 grams flour.) In 2021, J. Kenji López-Alt revisited the recipe and shared his own tweaked version. **—Mark Bittman**

SONNENBLUMENKERN VOLKENBROT (X2)
BY ASA MEASE

MIX SEPARATELY THE NIGHT BEFORE:

LEVAIN:

AP FLOUR	75G
WW FLOUR	25G
STARTER	15G
H20 @ 75°	100G

AVAILABLE IN STORE ONLY

Mestemacher Sunflower Seed Bread

64 Reviews SKU: 350996

Members get 15% Off Store Pick-Up & No Shipping Fee Join Now

$3.99

MESTEMACHER SUNFLOWER SEED BREAD FROM WORLD MARKET (FORMERLY COST PLUS WORLD MARKET)17.4 OUNCES. IMPORTED FROM GERMANY. “A DELICIOUS GUILT-FREE TREAT WITH NO WHEAT.”

RYE PREFERMENT:

RYE FLOUR	300G
STARTER	55G
H20 @ 75°	245G

SEED SOAKER:

RYE CHOPS[1]	150G
MILLET	75G
PUMPKIN SDS	50G
SUNFLOWER SDS	50G
CARAWAY SDS	6G
FENNEL SDS	3G
H20 @ 212°[2]	600G

A TRAY OF SUNFLOWER SEEDS IS THE EASIEST WAY TO COVER THE EXTERIOR OF THE LOAF.

[1] BLEND RYE BERRIES UNTIL MEDIUM-FINE CONSISTENCY
[2] IF AT ALTITUDE, USE BOILING TEMPERATURE

LEAVE AT ROOM TEMPERATURE OVERNIGHT

DOUBLE SCORE ON THE TOP
BAKED IN A 9" X 5" PAN

NEXT MORNING

THE FINAL DOUGH MIX:

H20 @ 75°	180G
YEAST	<1G
LEVAIN	215G
RYE PREFERMENT	600G
DRAINED SEEDS	ALL
RYE FLOUR	200G
BUCKWHEAT FLOUR	130G
SALT	20G

MIX FOR 5 MINUTES W/ MECHANICAL AID
IT SHOULD FEEL LIKE CLAY IN YOUR HANDS
DIVIDE EVENLY & SHAPE INTO LOAF
ROLL IN SUNFLOWER SEEDS
PRESS INTO GREASED PANS
DUST WITH FLOUR AND SCORE W/ BLADE

AFTER 50% RISE (2-3 HOURS)

BAKE:

@ 500° FOR 20 MIN
LOWER TEMP TO 450° FOR 30 MIN
CHECK IN 20 MIN INTERVALS UNTIL
INTERNAL TEMP IS 205°

REMOVE FROM OVEN & PAN
MOVE TO RACK TO COOL
EAT THE FOLLOWING DAY

Sunflower Seeds by Ai WeiWei 2010. 1 of 100 million hand-painted porcelain seeds produced in Jingdezhen, China over two years. Comissioned by the Tate Modern. Sponsored by Unilever.

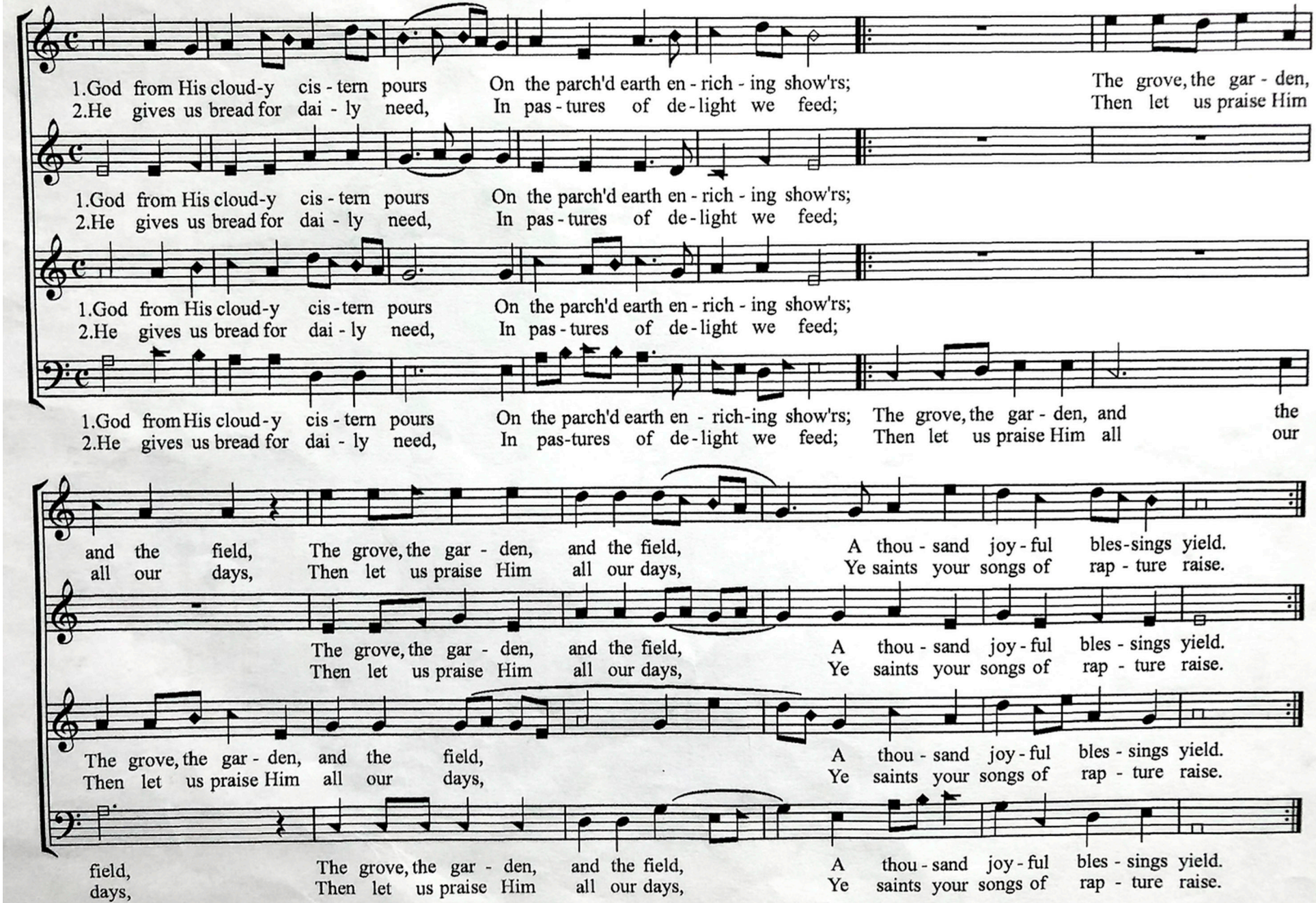

The Theater is just a vehicle for the bread.
It's not the other way around.

Garden

L.M.

A Minor Isaac Watts

Newcomb



3. His bounteous hands our table spread; He fills our cheerful stores with bread;
While food our daily strength imparts, Let daily praise inspire our hearts.

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